

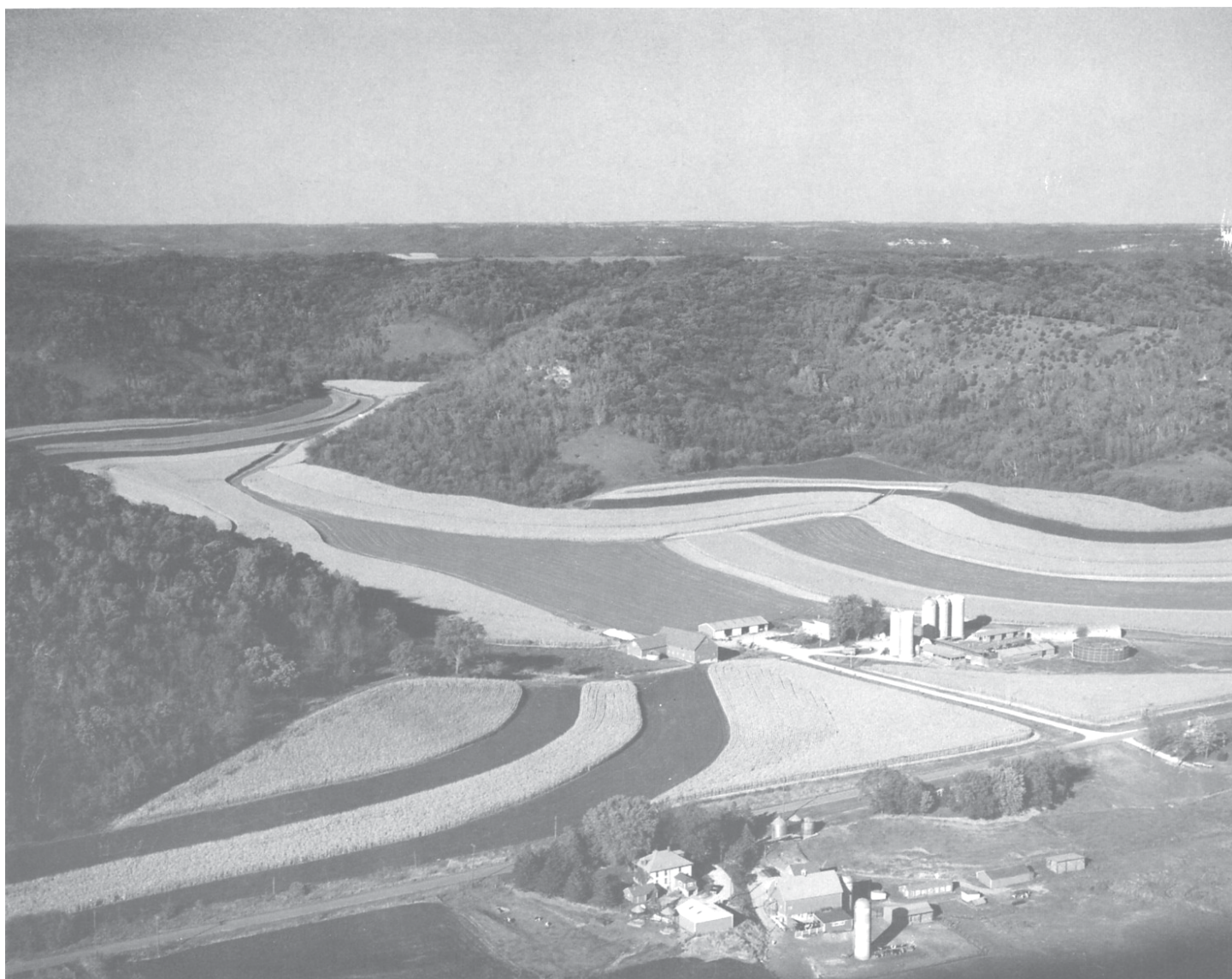


United States  
Department of  
Agriculture

Soil  
Conservation  
Service

In cooperation with  
Minnesota Agricultural  
Experiment Station

# Soil Survey of Winona County, Minnesota



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# How To Use This Soil Survey

## General Soil Map

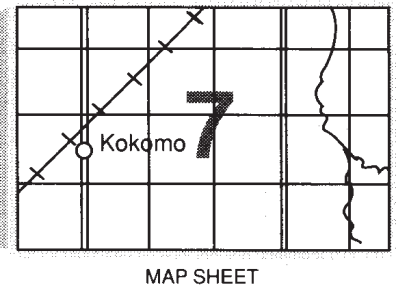
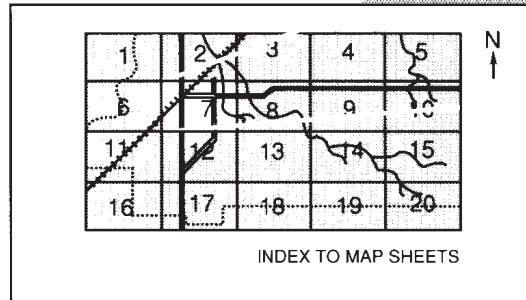
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

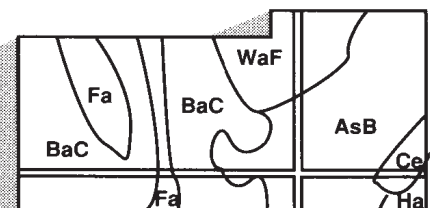
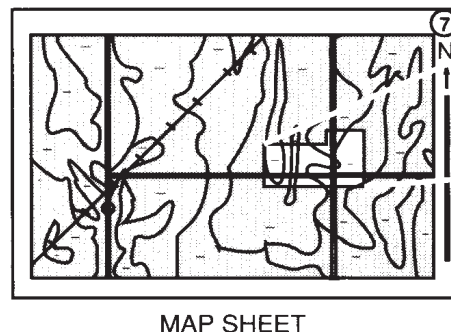
## Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

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This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1986. Soil names and descriptions were approved in 1987. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service and the Minnesota Agricultural Experiment Station. Assistance was provided by the Agricultural Extension Service and the Soil and Water Conservation Board. The survey was partially funded by the Legislative Commission for Minnesota Resources and Winona County. It is part of the technical assistance furnished to the Winona Soil and Water Conservation District.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

All programs and services of the Soil Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

**Cover: Contour stripcropping in an area of Seaton soils near the village of Altura.**



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# Foreword

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This soil survey contains information that can be used in land-planning programs in Winona County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.



Gary R. Nordstrom  
State Conservationist  
Soil Conservation Service

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# Soil Survey of Winona County, Minnesota

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By Robert A. Lueth, Soil Conservation Service

Fieldwork by David L. Aldeen, George A. Poch, Robert A. Lueth, and Carroll E. Oskrig,  
Soil Conservation Service, and Robert S. Guthrie, Stephen E. Lawler, and  
Norman R. Mofjeld, Minnesota Agricultural Experiment Station

United States Department of Agriculture, Soil Conservation Service,  
in cooperation with  
the Minnesota Agricultural Experiment Station

WINONA COUNTY borders the Mississippi Valley in the southeastern part of Minnesota (fig. 1). It has a total land area of 396,680 acres, or about 628 square miles, and has about 8,500 acres of water. Winona, the county seat, is located on the Mississippi River in the northeastern part of the county.

Dairy farming is the main livestock enterprise in the county. Beef cattle and hog production also are important. Beef cattle enterprises include cow-calf and feeder operations. Turkeys are raised in the western part of the county. The climate is well suited to corn, alfalfa, grasses, and oats, which are the crops commonly grown in the county. Apples are an important crop in the southeastern part of the county.

A more generalized survey of Winona County was published in 1941 (3). The present survey provides additional information and shows the soils in greater detail.

## General Nature of the County

This section gives general information about the county. It describes climate; history and development; transportation facilities and markets; farming; water supply; and physiography, relief, and drainage.

## Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Winona in the period

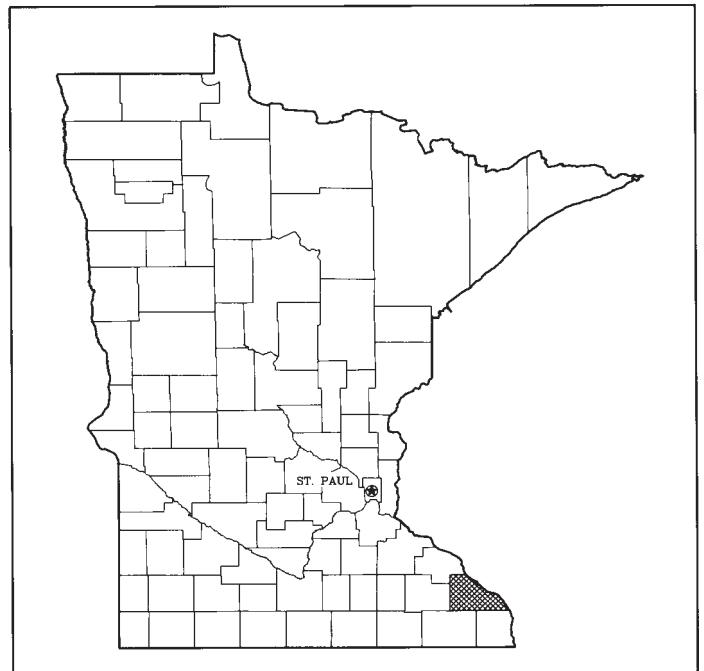


Figure 1.—Location of Winona County in Minnesota.

1951 to 1980. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter, the average temperature is 17 degrees F

and the average daily minimum temperature is 7 degrees. The lowest temperature on record, which occurred at Winona on January 30, 1951, is -32 degrees. In summer, the average temperature is 70 degrees and the average daily maximum temperature is 82 degrees. The highest recorded temperature, which occurred at Winona on June 20, 1953, is 103 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 33 inches. Of this, about 24 inches, or 72 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.3 inches at Winona on July 1, 1978. Thunderstorms occur on about 41 days each year.

The average seasonal snowfall is about 48 inches. The greatest snow depth at any one time during the period of record was 32 inches. On the average, 95 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 70 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 55 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 10 miles per hour, in spring.

Tornadoes and severe thunderstorms strike occasionally. These storms are local in extent and of short duration. They result in sparse damage. At times during the warmer part of the year, hailstorms occur in irregular patterns in small areas.

## History and Development

Willard Brady Bunnell and Francis La Bathe, the first Europeans to settle in the area that is now Winona County, were fur traders. They arrived in the area in the late 1830's (14). They were soon joined by missionaries, Indian agents, and land speculators.

Other settlers began to arrive during the summer of 1851, after a treaty with the Indians was signed at Traverse de Sioux. This treaty ceded nearly all of southern Minnesota to the United States government. That summer, the town of Winona and the community

that is now Minnesota City were established. In 1852, settlers began moving into nearby valleys. In 1854, Winona County was created from a portion of Fillmore County.

The town of Winona developed rapidly as a shipping center. In 1862, a railroad was completed between Winona and Stockton. It was soon extended to Rochester. In 1868, Winona was rated as the fourth primary grain market in the United States. The sawmill industry also developed rapidly in the area. It reached its peak in 1892 (3).

## Transportation Facilities and Markets

Two railroads serve the county. One crosses the west-central part of the county, and the other follows the flood plain along the Mississippi River in the northern and eastern parts of the county.

The major highways in the county are paved, but most county and township roads are made of crushed rock. Interstate 90 crosses the county from east to west. U.S. Highway 14 crosses the west-central part of the county and intersects with U.S. Highway 61 at Winona. U.S. Highway 61 crosses the county from north to south parallel to the flood plain along the Mississippi River. State Highway 43 is another major route that crosses part of the county.

Generally, livestock is taken by truck to South St. Paul or to La Crosse, Wisconsin. Milk is shipped mainly by truck. Interstate 90 and U.S. Highway 14 serve as major shipping routes across South Dakota and southern Minnesota and provide access to the river barge terminal at Winona.

## Farming

Before 1852, almost all of the land in Winona County was woodland or prairie. Cultivation consisted mainly of a few small scattered patches of corn tended by the Sioux. During the early 1860's, vegetables and feed for livestock were produced mainly for home use. Because of the rapid development of farm machinery and the increased demand for food during the Civil War years, wheat had become the main crop in the county by the mid-1860's. Wheat production reached its peak in 1877 (3), but extreme heat and heavy rain ruined crops in the following year. The effects of continuous cropping and disease and insects also reduced yields.

As wheat production declined, raising hogs and cattle became important. Corn was planted on large tracts of land. In many places it was planted on slopes that were too steep and long to be suitable for cultivation. Preparing a seedbed for corn involved intensive tillage, and repeated cultivation was required to control



weeds (8). The resulting loss of organic matter, poor tilth, and large areas of exposed soil led to gully erosion so severe that some fields were abandoned.

Dairy farming in the county began in the 1890's but did not become important until the cooperative creamery movement began in 1897. Dairy farmers grew close-growing crops and pasture plants, such as timothy, clover, and other grasses and legumes, that help to control erosion. These crops grew well in the area. As a result, dairy farming increased and became more important than beef cattle to the economy of the county (3).

Since 1935, conservation practices have been applied to many farms in the county, particularly in the southern and eastern parts, where the soils used for crops are mostly sloping or moderately steep. Contour stripcropping is practiced on many farms in these areas. Gullies have been filled, shaped, and seeded to form grassed waterways. Terraces have been installed on some farms. These conservation practices, along with diversions and dams, reduce flooding in the valleys.

In 1980, the county had 83,000 head of cattle. Of these, 11,000 were beef cows. The number of hogs was 75,000, and the number of sheep and lambs was 1,900.

In 1983, there were 1,221 farms in the county. The farms averaged 250 acres in size, of which an average of 140 acres was used for crops (7).

## Water Supply

The water supply for Winona County is drawn mostly from different bedrock formations in different parts of the county. These formations are below the mantle of loess, glacial drift, and preglacial deposits (5, 9). The deposits above the bedrock are too thin in most places to provide a dependable supply of water. The thick, coarse textured alluvium in the valleys along the Mississippi River, however, provides large quantities of water for municipal and industrial uses.

The highest lying bedrock formation that yields water in the county is the St. Peter Sandstone Formation. Because the water escapes easily to lower formations, however, the St. Peter Formation provides insufficient yields for industrial uses.

The Shakopee Dolomite and Oneota Dolomite are below the St. Peter Formation. They contain water in joints and solution passages but generally do not provide adequate supplies for farm and home uses. In a few places, however, thin strata of the New Richmond Sandstone between the Shakopee Dolomite and the Oneota Dolomite yield water for farm and home uses.

The Jordan Sandstone is the main source of water for communities in the uplands. Yields are lower,

however, near the edge of valleys where water escapes to streams in the valleys below.

Immediately below the Jordan Sandstone are the St. Lawrence and Franconia Formations, but these formations are not important sources of water. Most farms in areas below the level of the Jordan Sandstone draw water from the Ironton Sandstone, the Galesville Sandstone, and the Mount Simon Sandstone, which lie near or below the level of the Mississippi River. Several communities along the Mississippi River also obtain their water from these sources.

The water drawn from the St. Peter Formation and the Jordan Sandstone is moderately hard. The Ironton Sandstone, the Galesville Sandstone, and the Mount Simon Sandstone yield water that is relatively soft.

## Physiography, Relief, and Drainage

Winona County is at the western edge of the Driftless Area of the upper Mississippi Valley. The uplands are part of a regional dissected plain. The plain consists of sedimentary rock that formed in sediments deposited by former inland seas. The difference in elevation between the ridgetops and the flood plains is as much as 600 feet. The elevation of the county ranges from 1,325 feet near St. Charles to 635 feet on the flood plain near La Crescent (fig. 2).

The uplands consist of a high, narrow ridge and a lower lying, dissected plain. Narrow spurs radiate from the main ridge, which is dissected into low, mesa-shaped hills in places. The lower lying plain, which makes up most of the county, was once nearly level but has been carved into an intricate pattern of deep valleys and ridges.

In the eastern part of the county, ridges are narrow. Ridgetops are generally sloping or moderately steep and are long and smooth. The slopes along creeks and rivers in the eastern and northern parts of the county are steep or very steep. In the western part of the county, the ridgetops are broader and are gently sloping to strongly sloping and the uplands are dissected by narrow drainageways. The plain adjacent to the high ridge in the St. Charles-Utica area is weakly dissected. In the southwestern part of the county, the landscape is less dissected and creeks are less incised than in the northern and eastern parts.

Valleys formed by the dissection of the plain have terraces along the major creeks and streams. These terraces are as much as 80 feet above the valley floor and generally are nearly level or gently sloping.

In most parts of the county, there are few natural depressions to hold runoff. In the west-central part of the county, however, in the western part of Utica Township and in St. Charles Township, sinkholes are

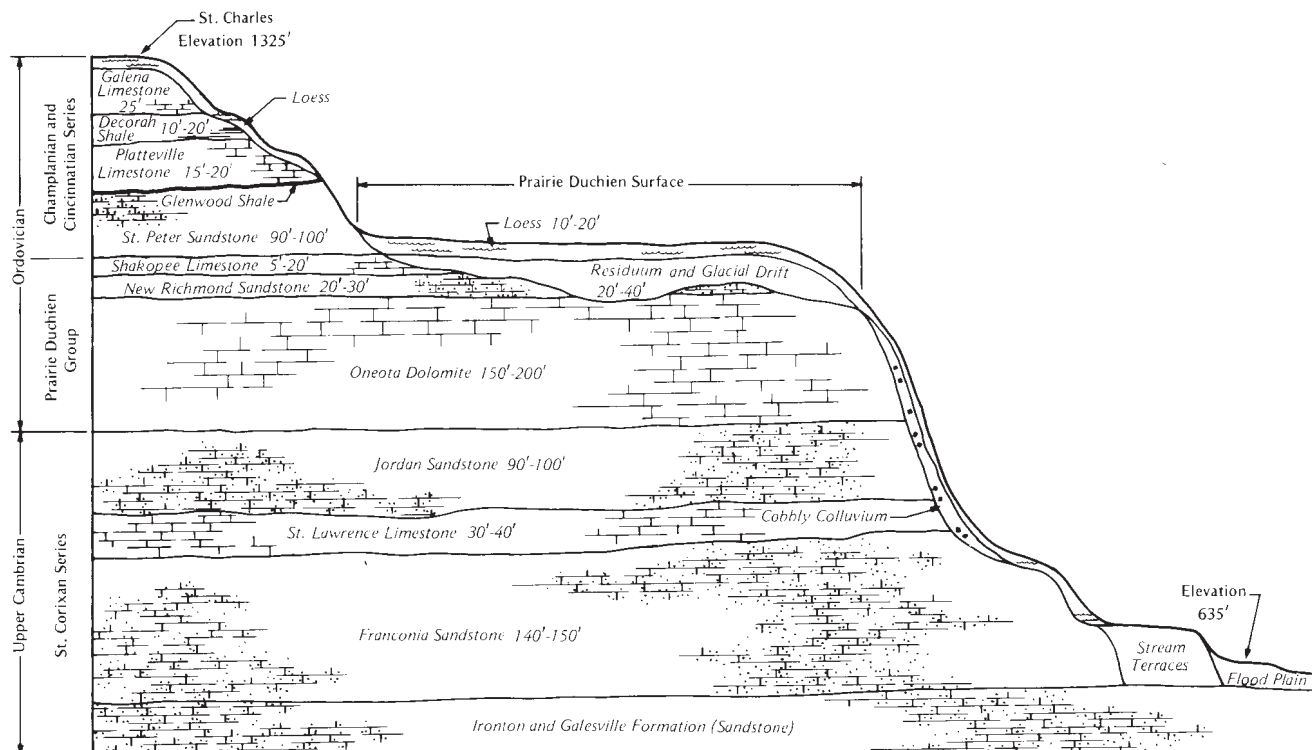


Figure 2.—Geologic cross section of Winona County, from west to east.

common on the lower plain. The sinkholes range from about 1 to 40 acres in size.

Most of the northern part of the county is drained by the Whitewater River, which flows directly into the Mississippi River. The northeastern part of the county is drained by a series of small creeks. The largest of these, Garvin Brook and Rollingstone Creek, flow directly into the Mississippi River. Pine Creek drains the southeastern part of the county and also flows directly into the Mississippi River. The southern part of the county is drained by a series of tributaries of the Root River, which flows to the Mississippi River through Fillmore and Houston Counties to the south. Trout, Bush, Money, and Pine Creeks are the most important of these tributaries.

## How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of

crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations,



supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they

drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names, and delineations of the soils in this soil survey do not agree fully with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or the extent of soils within the survey areas.

Soil scientists were denied access to a few tracts in the county. These areas were mapped using aerial photo interpretations and knowledge of the surrounding area. The soil boundaries are less accurately drawn in these areas than in areas where the soil scientists had access to the land and could examine the soils.

## Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by two or three kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so

complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the

landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

# General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

## 1. Mt. Carroll-Port Byron-Lindstrom Association

*Very deep, nearly level to steep, well drained and moderately well drained soils; on uplands (fig. 3)*

### Setting

*Landform and position on the landform: Concave, convex, and plane areas on uplands*  
*Slope range: 1 to 20 percent*

### Composition

*Percent of survey area: 14*

*Extent of components in the association:*

- Mt. Carroll soils and similar soils—45 percent
- Port Byron soils and similar soils—35 percent
- Lindstrom soils and similar soils—9 percent
- Minor soils—11 percent

### Soil Properties and Qualities

#### Mt. Carroll

*Drainage class: Well drained*  
*Parent material: Loess*

*Surface texture: Silt loam*

#### Port Byron

*Drainage class: Well drained and moderately well drained*

*Parent material: Loess*

*Surface texture: Silt loam*

#### Lindstrom

*Drainage class: Well drained*

*Parent material: Silty sediments*

*Surface texture: Silt loam*

### Minor Soils

- The somewhat excessively drained Sogn soils on the crest of ridges
- The well drained Frankville soils in convex areas
- The well drained and moderately well drained Eitzen soils on flood plains
- The well drained Nasset soils in convex areas

### Use and Management

*Major use: Cropland*

*Secondary uses: Pasture, woodland*

*Major management factors: Water erosion*

## 2. Seaton-NewGlarus-Palsgrove Association

*Moderately deep to very deep, nearly level to very steep, well drained soils; on uplands*

### Setting

*Landform and position on the landform: Convex and plane areas and side slopes on uplands*  
*Slope range: 1 to 45 percent*

### Composition

*Percent of survey area: 18*

*Extent of components in the association:*

- Seaton soils and similar soils—64 percent
- NewGlarus soils and similar soils—16 percent
- Palsgrove soils and similar soils—9 percent
- Minor soils—11 percent



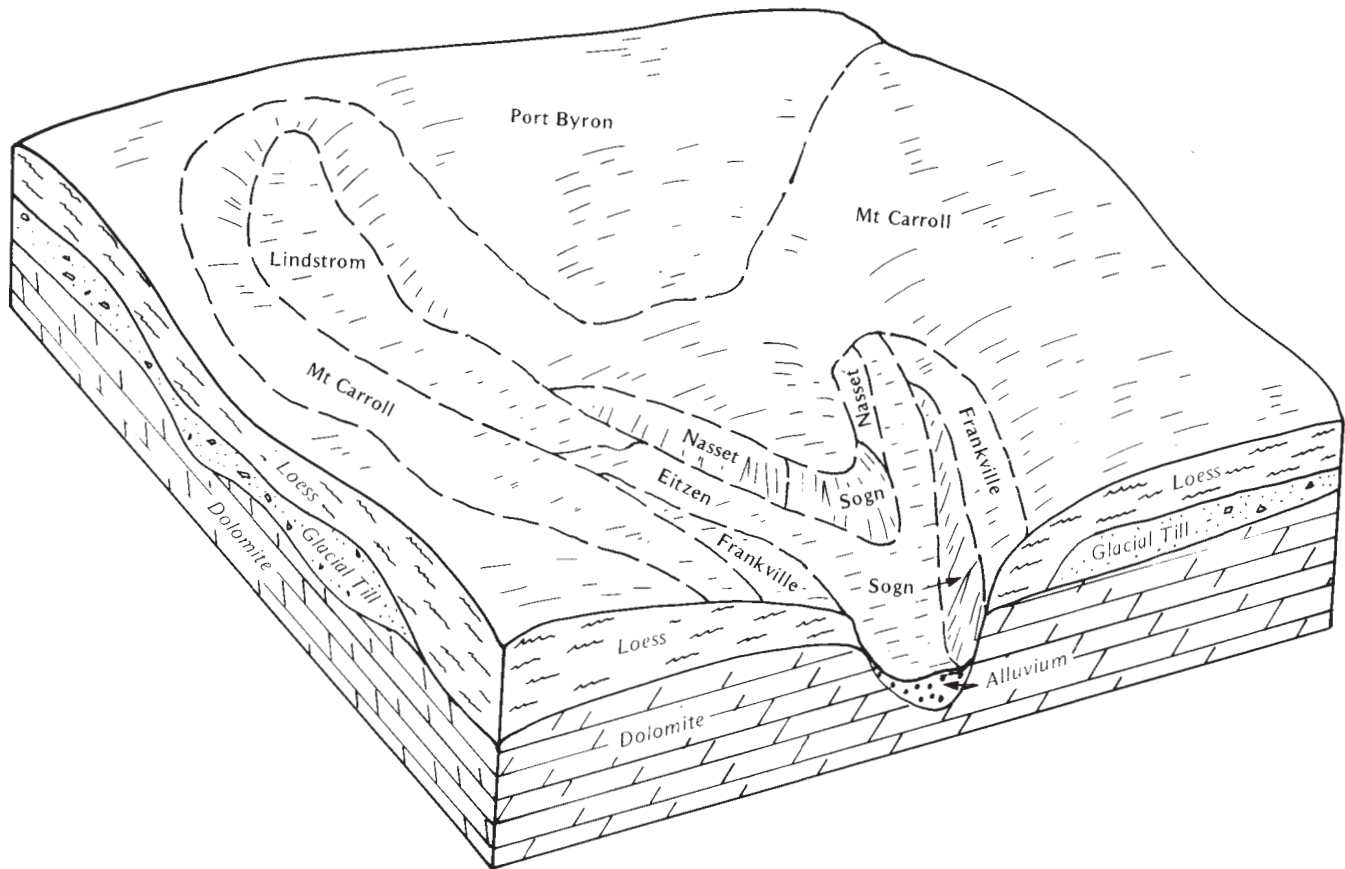


Figure 3.—Pattern of soils and underlying material in the Mt. Carroll-Port Byron-Lindstrom association.

### **Soil Properties and Qualities**

#### **Seaton**

*Drainage class:* Well drained

*Parent material:* Loess

*Surface texture:* Silt loam

#### **NewGlarus**

*Drainage class:* Well drained

*Parent material:* Loess and clayey residuum over bedrock

*Surface texture:* Silt loam

#### **Palsgrove**

*Drainage class:* Well drained

*Parent material:* Loess and the underlying residuum weathered from dolomite bedrock

*Surface texture:* Silt loam

### **Minor Soils**

- The well drained Blackhammer soils on convex slopes

- The well drained Dunbarton soils on the middle or lower part of side slopes
- The well drained and moderately well drained Eitzen soils on flood plains
- The well drained Gale soils on side slopes

### **Use and Management**

*Major use:* Cropland

*Secondary uses:* Pasture, woodland

*Major management factors:* Water erosion

### **3. Seaton-Southridge-Blackhammer Association**

*Very deep, nearly level to very steep, well drained soils; on uplands (fig. 4)*

### **Setting**

*Landform and position on the landform:* Plane and convex areas on uplands

*Slope range:* 1 to 45 percent

### **Composition**

*Percent of survey area:* 14

*Extent of components in the association:*

- Seaton soils and similar soils—36 percent
- Southridge soils and similar soils—17 percent
- Blackhammer soils and similar soils—12 percent
- Minor soils—35 percent

### **Soil Properties and Qualities**

#### **Seaton**

*Drainage class:* Well drained

*Parent material:* Loess

*Surface texture:* Silt loam

#### **Southridge**

*Drainage class:* Well drained

*Parent material:* Loess over residuum

*Surface texture:* Silt loam

#### **Blackhammer**

*Drainage class:* Well drained

*Parent material:* Loess and the underlying stratified residuum

*Surface texture:* Silt loam

### **Minor Soils**

- The well drained Dunbarton soils on the middle or lower part of side slopes
- The well drained Nodine, NewGlarus, and Rollingstone soils in convex areas

### **Use and Management**

*Major use:* Cropland

*Secondary uses:* Pasture, woodland

*Major management factors:* Water erosion

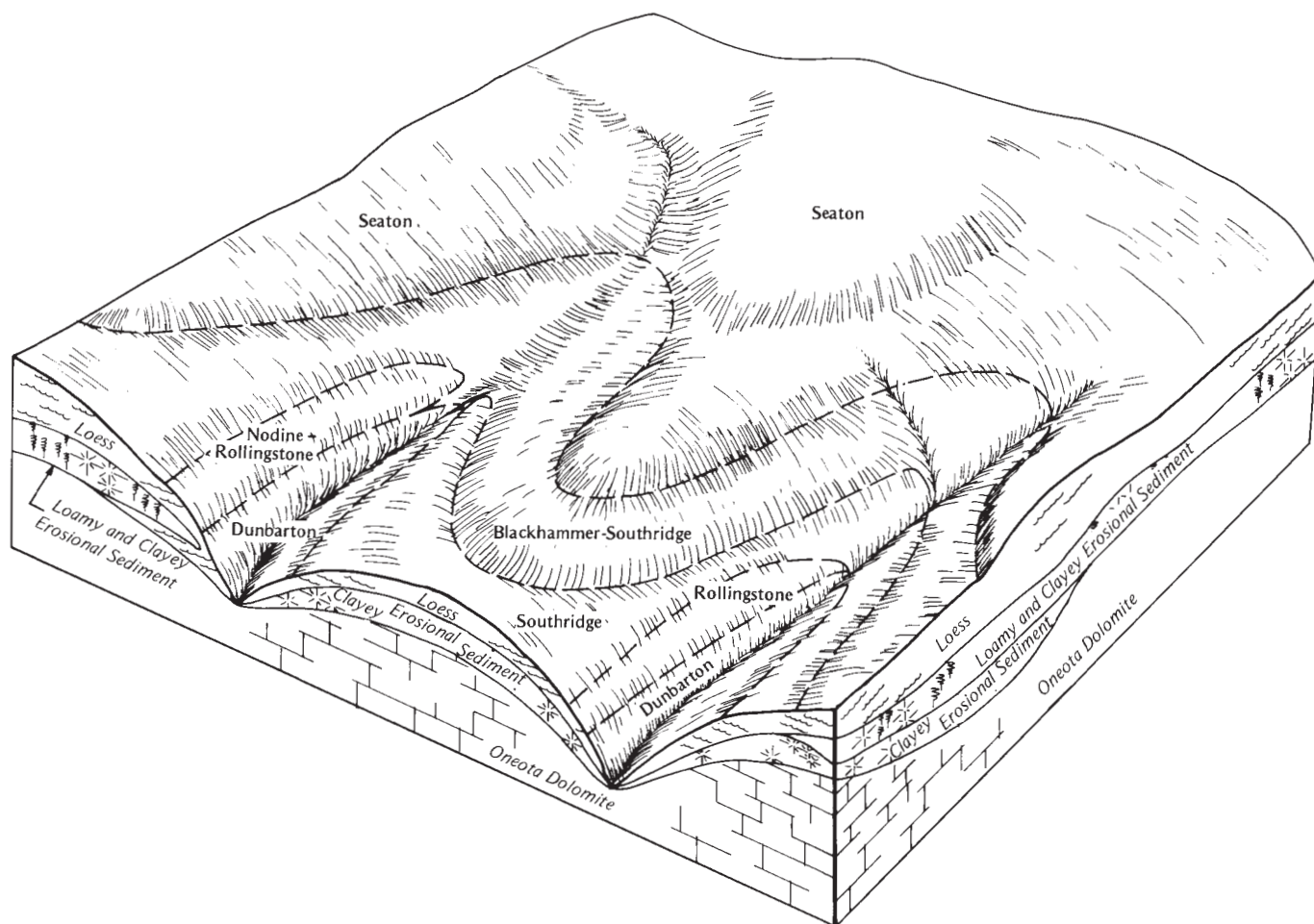


Figure 4.—Pattern of soils and underlying material in the Seaton-Southridge-Blackhammer association.

#### 4. Port Byron-Frankville Association

*Moderately deep to very deep, nearly level to moderately steep, well drained and moderately well drained soils; on uplands*

##### **Setting**

*Landform and position on the landform:* Concave, convex, and plane areas on uplands  
*Slope range:* 1 to 18 percent

##### **Composition**

*Percent of survey area:* 4  
*Extent of components in the association:*  
 Port Byron soils and similar soils—35 percent  
 Frankville soils and similar soils—30 percent  
 Minor soils—35 percent

##### **Soil Properties and Qualities**

##### **Port Byron**

*Drainage class:* Well drained and moderately well drained  
*Parent material:* Loess  
*Surface texture:* Silt loam

##### **Frankville**

*Drainage class:* Well drained  
*Parent material:* Loess and the underlying residuum  
*Surface texture:* Silt loam

##### **Minor Soils**

- The excessively drained Boone soils on knolls
- The excessively drained Brodale and Bellechester soils on side slopes
- The very poorly drained Haverhill soils in plane areas
- The well drained Lacrescent soils on side slopes
- The well drained Spinks soils in plane, convex, or concave areas
- The somewhat excessively drained Sogn soils on the crest of ridges

##### **Use and Management**

*Major use:* Cropland  
*Secondary use:* Pasture  
*Major management factors:* Water erosion

#### 5. Waukee-Rockton-Racine Association

*Moderately deep to very deep, nearly level to sloping, well drained and moderately well drained soils; on uplands and terraces (fig. 5)*

##### **Setting**

*Landform and position on the landform:* Plane areas,

summits, and side slopes on uplands and terraces  
*Slope range:* 0 to 12 percent

##### **Composition**

*Percent of survey area:* 4  
*Extent of components in the association:*  
 Waukee soils and similar soils—40 percent  
 Rockton soils and similar soils—15 percent  
 Racine soils and similar soils—10 percent  
 Minor soils—35 percent

##### **Soil Properties and Qualities**

##### **Waukee**

*Drainage class:* Well drained  
*Parent material:* Alluvium  
*Surface texture:* Loam

##### **Rockton**

*Drainage class:* Well drained  
*Parent material:* Loamy sediments over dolomite bedrock  
*Surface texture:* Silt loam

##### **Racine**

*Drainage class:* Moderately well drained  
*Parent material:* Thin mantle of silty or loamy erosional sediments and the underlying loamy glacial till  
*Surface texture:* Silt loam

##### **Minor Soils**

- The excessively drained Boone soils on knolls
- The poorly drained Marshan soils in plane or concave areas on terraces
- The well drained Spinks soils in plane or concave areas
- The poorly drained Tripoli soils in plane or slightly concave areas

##### **Use and Management**

*Major use:* Cropland  
*Secondary use:* Pasture  
*Major management factors:* Waukee and Rockton—droughtiness; Racine—water erosion

#### 6. Lacrescent-Lamoille Association

*Deep and very deep, steep and very steep, well drained soils; on uplands*

##### **Setting**

*Landform and position on the landform:* Plane and convex areas and side slopes on uplands  
*Slope range:* 20 to 70 percent

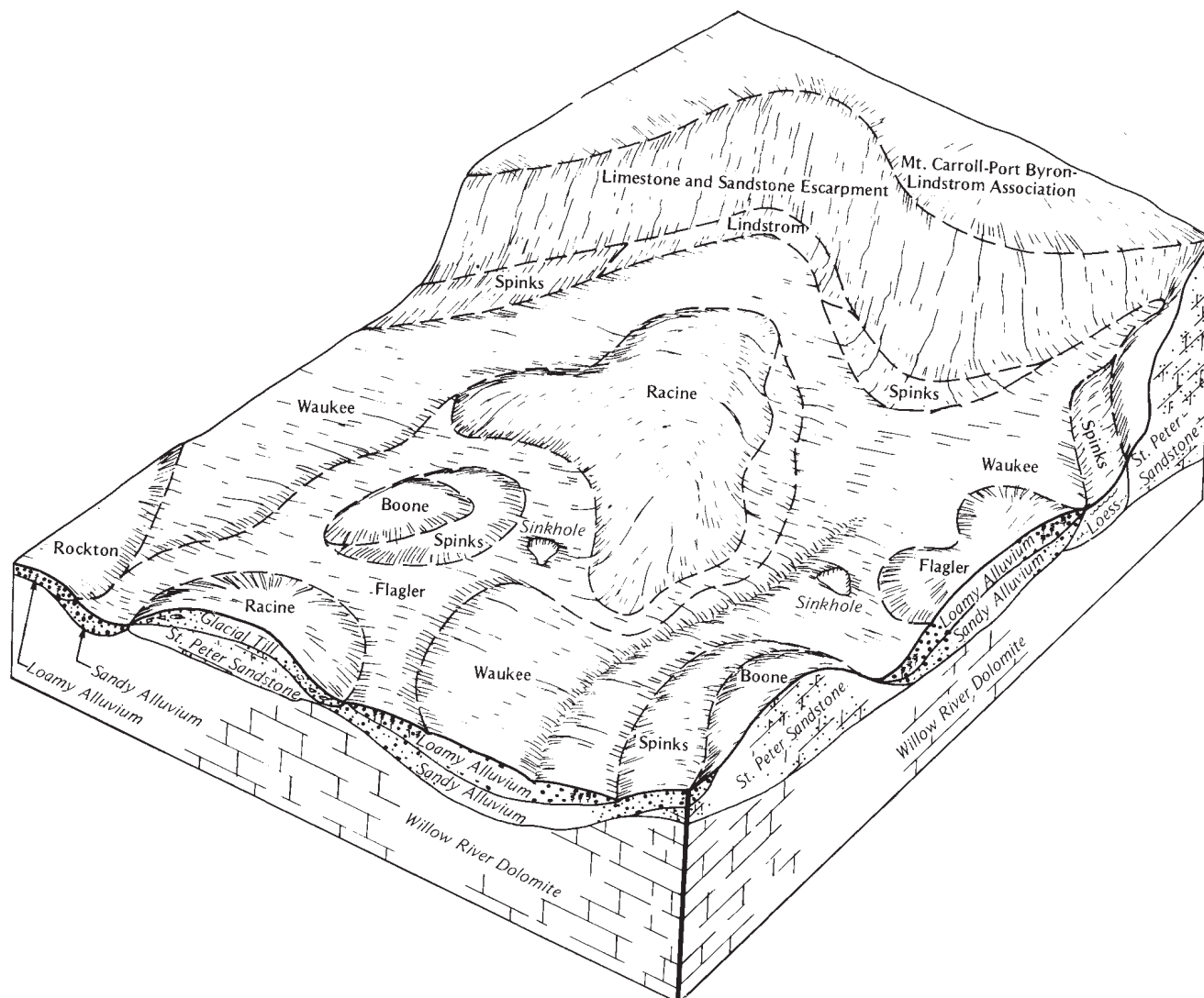


Figure 5.—Pattern of soils and underlying material in the Waukee-Rockton-Racine association.

### Composition

Percent of survey area: 31

Extent of components in the association:

Lacrescent soils and similar soils—50 percent

Lamoille soils and similar soils—20 percent

Minor soils—30 percent

### Soil Properties and Qualities

#### Lacrescent

Drainage class: Well drained

Parent material: Loess and colluvium

Surface texture: Silt loam

#### Lamoille

Drainage class: Well drained

Parent material: Loess and the underlying residuum

Surface texture: Silt loam

### Minor Soils

- The well drained and moderately well drained Beaver Creek soils in plane areas on flood plains
- The well drained Blackhammer, Dorerton, Elbaville, and Rollingstone soils on convex slopes
- The excessively drained Brodale soils on side slopes
- The well drained Dunbarton soils on the middle or lower part of side slopes
- The moderately well drained Huntsville soils on flood plains
- The well drained Southridge soils in convex areas



- The well drained Seaton soils in convex areas and on side slopes

### **Use and Management**

*Major use:* Woodland

*Secondary use:* Pasture

*Major management factors:* Water erosion

## **7. Chaseburg-Plainfield-Newalbin Association**

*Very deep, nearly level to very steep, poorly drained, very poorly drained, moderately well drained, and excessively drained soils; on flood plains, terraces, and uplands*

### **Setting**

*Landform and position on the landform:* Plane and convex areas and side slopes on flood plains and terraces

*Slope range:* 0 to 50 percent

### **Composition**

*Percent of survey area:* 3

*Extent of components in the association:*

Chaseburg soils and similar soils—32 percent

Plainfield soils and similar soils—23 percent

Newalbin soils and similar soils—13 percent

Minor soils—32 percent

### **Soil Properties and Qualities**

#### **Chaseburg**

*Drainage class:* Moderately well drained

*Parent material:* Alluvium

*Surface texture:* Silt loam

#### **Plainfield**

*Drainage class:* Excessively drained

*Parent material:* Deep, sandy sediments

*Surface texture:* Sand

#### **Newalbin**

*Drainage class:* Poorly drained and very poorly drained

*Parent material:* Alluvium

*Surface texture:* Silt loam

### **Minor Soils**

- The well drained and moderately well drained Abscota Variant and Beaver Creek soils in plane areas on flood plains
- The well drained and moderately well drained Becker soils on high, level benches on flood plains
- The well drained and moderately well drained Festina soils in plane areas on terraces

### **Use and Management**

*Major use:* Woodland

*Secondary use:* Pasture

*Major management factors:* Chaseburg—flooding; Plainfield—droughtiness, water erosion, soil blowing; Newalbin—flooding, wetness

## **8. Seaton-Newalbin-Festina Association**

*Very deep, nearly level to very steep, poorly drained, very poorly drained, moderately well drained, and well drained soils; on flood plains, terraces, and uplands*

### **Setting**

*Landform and position on the landform:* Plane, convex, and concave areas on flood plains, terraces, and uplands

*Slope range:* 0 to 45 percent

### **Composition**

*Percent of survey area:* 8

*Extent of components in the association:*

Seaton soils and similar soils—25 percent

Newalbin soils and similar soils—20 percent

Festina soils and similar soils—20 percent

Minor soils—35 percent

### **Soil Properties and Qualities**

#### **Seaton**

*Drainage class:* Well drained

*Parent material:* Loess

*Surface texture:* Silt loam

#### **Newalbin**

*Drainage class:* Poorly drained and very poorly drained

*Parent material:* Alluvium

*Surface texture:* Silt loam

#### **Festina**

*Drainage class:* Well drained and moderately well drained

*Parent material:* Alluvium

*Surface texture:* Silt loam

### **Minor Soils**

- The well drained and moderately well drained Beaver Creek soils in plane areas on flood plains
- The moderately well drained Chaseburg and Huntsville soils on flood plains
- The well drained Lindstrom soils in plane and concave areas
- The moderately well drained Medary soils in plane areas
- The well drained Norden soils in convex areas
- The very poorly drained Otter soils on flood plains



- The well drained Timula soils in convex areas

### ***Use and Management***

*Major use:* Cropland

*Secondary use:* Pasture

*Major management factors:* Seaton and Festina—water erosion; Newalbin—flooding, wetness

## **9. Urban land-Finchford Association**

*Urban land and very deep, nearly level, excessively drained soils; on terraces*

### ***Setting***

*Landform and position on the landform:* Plane areas on terraces

*Slope range:* 0 to 2 percent

### ***Composition***

*Percent of survey area:* 2

*Extent of components in the association:*

Urban land—60 percent

Finchford soils and similar soils—30 percent

Minor soils—10 percent

### ***Soil Properties and Qualities***

**Urban land:** Consists of streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is impossible

#### **Finchford**

*Drainage class:* Excessively drained

*Parent material:* Alluvium

*Surface texture:* Sandy loam

### ***Minor Soils***

- The moderately well drained Minneopa soils in landscape positions similar to those of the Finchford soils
- The poorly drained Newalbin soils on flood plains
- The very poorly drained Otter soils on flood plains
- The well drained Billett soils on stream terraces and uplands

- The moderately well drained Huntsville soils on flood plains

### ***Use and Management***

*Major use:* Urban land

## **10. Comfrey-Shiloh Association**

*Very deep, nearly level, very poorly drained and poorly drained soils; on flood plains*

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

### ***Composition***

*Percent of survey area:* 2

*Extent of components in the association:*

Comfrey soils and similar soils—60 percent

Shiloh soils and similar soils—30 percent

Minor soils—10 percent

### ***Soil Properties and Qualities***

#### **Comfrey**

*Drainage class:* Poorly drained

*Parent material:* Alluvium

*Surface texture:* Silt loam

#### **Shiloh**

*Drainage class:* Very poorly drained

*Parent material:* Alluvium

*Surface texture:* Silt loam

### ***Minor Soils***

- The very poorly drained Newalbin soils on flood plains
- The moderately well drained Minneiska soils on flood plains

### ***Use and Management***

*Major use:* Woodland

*Major management factors:* Flooding and wetness

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## Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under the heading "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Seaton silt loam, 3 to 6 percent slopes, is a phase of the Seaton series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Huntsville-Beavercreek complex, channeled, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ

substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The "Glossary" defines many of the terms used in describing the soils.

**Note to User.**—This technical publication includes suggested management practices that are intended to increase crop production, to control soil blowing and water erosion, and to reduce wetness. Over a period of time, some or all of these conservation practices may or may not be in accordance with Federal, State, and local laws and agency rules and guidelines.

### 11B—Sogn silt loam, 1 to 6 percent slopes

#### **Composition**

Sogn soil and similar soils: 85 to 90 percent  
Contrasting inclusions: 10 to 15 percent

#### **Setting**

*Landform and position on the landform:* Crests of narrow ridges and butte-like hills on uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 10 acres

#### **Typical Profile**

0 to 8 inches—black silt loam

8 to 12 inches—very dark brown silt loam

12 to 16 inches—very dark grayish brown silt loam

16 to 19 inches—very dark grayish brown extremely  
gravelly loam  
19 inches—dolomite bedrock

### **Soil Properties and Qualities**

*Depth class:* Shallow  
*Drainage class:* Somewhat excessively drained  
*Permeability:* Moderate  
*Available water capacity:* Low  
*Organic matter content:* Low  
*Surface runoff:* Medium  
*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The well drained Frankville and Rockton soils, which are deeper over bedrock than the Sogn soil; on plane areas in the uplands
- Rock outcrop

*Similar soils:*

- Soils that have a surface layer of loam

### **Use and Management**

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

### **Interpretive Groups**

*Land capability classification:* VIs

*Woodland ordination symbol:* Not assigned

## **11D—Sogn silt loam, rocky, 6 to 30 percent slopes**

### **Composition**

Sogn soil and similar soils: 85 to 90 percent  
Contrasting inclusions: 10 to 15 percent

### **Setting**

*Landform and position on the landform:* Shoulder slopes and side slopes of ridges on uplands

*Shape of areas:* Elongated

*Size of areas:* 3 to 8 acres

### **Typical Profile**

0 to 13 inches—very dark gray silt loam  
13 to 15 inches—very dark grayish brown silt loam  
15 inches—dolomite bedrock

### **Soil Properties and Qualities**

*Depth class:* Very shallow and shallow  
*Drainage class:* Somewhat excessively drained

*Permeability:* Moderate  
*Available water capacity:* Low  
*Organic matter content:* Moderate  
*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Rock outcrop in 1 to 10 percent of the unit

### **Inclusions**

*Contrasting inclusions:*

- The well drained Lindstrom, Nasset, and Rockton and excessively drained Brodale soils, which are in landscape positions similar to those of the Sogn soil and on the lower foot slopes

*Similar soils:*

- Soils that have a surface layer of loam

### **Use and Management**

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

### **Interpretive Groups**

*Land capability classification:* VIIIs

*Woodland ordination symbol:* Not assigned

## **19—Chaseburg silt loam**

### **Composition**

Chaseburg soil and similar soils: 96 to 98 percent  
Contrasting inclusions: 2 to 4 percent

### **Setting**

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Elongated

*Size of areas:* 5 to 100 acres

### **Typical Profile**

0 to 9 inches—dark grayish brown silt loam  
9 to 60 inches—stratified dark grayish brown and grayish brown silt loam and very fine sandy loam

### **Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Moderately well drained  
*Permeability:* Moderate  
*Available water capacity:* Very high  
*Organic matter content:* Moderate



*Surface runoff:* Slow

*Depth to water table:* 3 to 6 feet

*Frequency of flooding:* Occasional

*Distinctive properties:* Scour channels throughout the unit

### ***Inclusions***

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils, which are in drainageways of deeply dissected uplands and are underlain by cobbly colluvium
- The poorly drained Newalbin soils in depressions on flood plains in broad stream valleys

*Similar soils:*

- Soils that have a surface layer of sandy loam

### ***Use and Management***

*Cropland:*

- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Seedlings survive and grow well if competing vegetation is removed or controlled.

### ***Interpretive Groups***

*Land capability classification:* I

*Woodland ordination symbol:* 4A

## **24—Kasson silt loam**

### ***Composition***

Kasson soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Summits on uplands

*Slope range:* 1 to 3 percent

*Shape of areas:* Irregular

*Size of areas:* 3 to 20 acres

### ***Typical Profile***

- 0 to 9 inches—very dark grayish brown silt loam
- 9 to 12 inches—grayish brown silt loam
- 12 to 17 inches—yellowish brown, mottled silt loam
- 17 to 60 inches—light olive brown, mottled loam

## ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate in the upper part, moderately slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* 2 to 3 feet

### ***Inclusions***

*Contrasting inclusions:*

- The somewhat poorly drained Lawler soils on summits
- The poorly drained Tripoli soils on the upper part of drainageways in the uplands

*Similar soils:*

- Soils that have a surface layer of loam

### ***Use and Management***

*Cropland:*

- Minimum tillage reduces the hazard of erosion.
- Applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* 5A

## **25—Becker fine sandy loam**

### ***Composition***

Becker soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### ***Setting***

*Landform and position on the landform:* High, level benches on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 4 to 40 acres

### ***Typical Profile***

- 0 to 9 inches—black very fine sandy loam
- 9 to 26 inches—black fine sandy loam
- 26 to 30 inches—very dark brown fine sandy loam
- 30 to 36 inches—dark brown fine sandy loam
- 36 to 43 inches—dark brown loamy fine sand

43 to 60 inches—dark brown and brown loamy fine sand

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderately rapid in the upper part, rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or high

*Surface runoff:* Slow

*Depth to water table:* 4 to 6 feet

*Frequency of flooding:* Rare

*Distinctive properties:* Scattered scour channels throughout the unit

### ***Inclusions***

*Contrasting inclusions:*

- Somewhat excessively drained, sandy alluvial soils
- The moderately well drained Chaseburg soils on the lower flood plains

*Similar soils:*

- Soils that have a surface layer of sandy loam or loam

### ***Use and Management***

*Cropland:*

- Planting should be delayed because of the rare flooding in early spring.
- The best suited crops are those that can withstand drought.
- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

### ***Interpretive Groups***

*Land capability classification:* IIIs

*Woodland ordination symbol:* Not assigned

## **79B—Billett fine sandy loam, 1 to 6 percent slopes**

### ***Composition***

Billett soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### ***Setting***

*Landform and position on the landform:* Ridges and side slopes on terraces and uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 20 acres

### ***Typical Profile***

0 to 9 inches—very dark grayish brown fine sandy loam

9 to 14 inches—dark brown fine sandy loam

14 to 26 inches—dark brown sandy loam

26 to 30 inches—very pale brown fine sand

30 to 60 inches—very pale brown and brownish yellow fine sand

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid in the upper part, rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderately low

*Surface runoff:* Slow

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Spinks soils on convex foot slopes
- The well drained Waukee soils on stream terraces

*Similar soils:*

- Soils that have a surface layer of loamy sand
- Soils that are underlain by gravelly sand or limestone or sandstone bedrock

### ***Use and Management***

*Cropland:*

- The best suited crops are those that can withstand drought.
- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIIs

*Woodland ordination symbol:* 4A

## 81B—Boone loamy fine sand, 2 to 6 percent slopes

### **Composition**

Boone soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### **Setting**

*Landform and position on the landform:* Knolls on uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 10 acres

### **Typical Profile**

0 to 8 inches—very dark grayish brown loamy fine sand

8 to 25 inches—brown and pale brown fine sand

25 to 60 inches—weakly cemented sandstone

### **Soil Properties and Qualities**

*Depth class:* Moderately deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Available water capacity:* Very low

*Organic matter content:* Low

*Surface runoff:* Slow

*Depth to water table:* More than 6 feet

*Distinctive properties:* Stones on the surface in places

### **Inclusions**

*Contrasting inclusions:*

- The somewhat excessively drained Flagler soils on the lower foot slopes

*Similar soils:*

- Soils that have a surface layer of fine sand or sandy loam
- Soils that are more than 40 inches deep over sandstone bedrock
- Soils that are moderately well drained

### **Use and Management**

*Cropland:*

- The best suited crops are those that can withstand drought.
- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

- The seedling mortality rate is high because of the droughtiness.

- Using harvesting methods that do not leave trees standing alone or widely spaced reduces the windthrow hazard.

### **Interpretive Groups**

*Land capability classification:* IVs

*Woodland ordination symbol:* 2D

## 81C—Boone loamy fine sand, 6 to 15 percent slopes

### **Composition**

Boone soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex knolls on uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 10 acres

### **Typical Profile**

0 to 8 inches—very dark grayish brown loamy fine sand

8 to 12 inches—dark brown loamy fine sand

12 to 18 inches—yellowish brown loamy fine sand

18 to 24 inches—yellowish brown fine sand

24 to 60 inches—weakly cemented sandstone

### **Soil Properties and Qualities**

*Depth class:* Moderately deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Available water capacity:* Very low

*Organic matter content:* Low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Stones on the surface in places

### **Inclusions**

*Contrasting inclusions:*

- The somewhat excessively drained Elevea and Flagler soils on the lower part of knolls

*Similar soils:*

- Soils that have a surface layer of fine sand or sandy loam
- Sandy soils that are more than 40 inches deep over sandstone bedrock

### **Use and Management**

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.



- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.
- The seedling mortality rate is high because of the droughtiness.
- Using harvesting methods that do not leave trees standing alone or widely spaced reduces the windthrow hazard.

### ***Interpretive Groups***

*Land capability classification:* VIs

*Woodland ordination symbol:* 2D

## **95C—Dunbarton silt loam, rocky, 4 to 12 percent slopes**

### ***Composition***

Dunbarton soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### ***Setting***

*Landform and position on the landform:* Middle or lower part of side slopes on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 7 inches—dark brown silt loam  
 7 to 10 inches—dark brown silty clay loam  
 10 to 18 inches—yellowish red cherty clay  
 18 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Shallow

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Common stones on the surface and rock outcrop in places; subsoil exposed by erosion in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained NewGlarus and Palsgrove soils near drainageways
- The somewhat excessively drained Sogn soils near ridgetops

- The well drained Rollingstone soils near the head of drainageways

*Similar soils:*

- Soils that have a surface layer of silty clay loam

### ***Use and Management***

*Cropland:*

- Tillage may be limited by the rocks on or near the surface.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Planting vigorous nursery stock and increasing the planting rate reduce seedling mortality.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* 4D

## **99B—Racine silt loam, 2 to 6 percent slopes**

### ***Composition***

Racine soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### ***Setting***

*Landform and position on the landform:* Summits of low hills on uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 100 acres

### ***Typical Profile***

0 to 5 inches—very dark gray silt loam  
 5 to 9 inches—dark grayish brown silt loam  
 9 to 13 inches—dark yellowish brown silt loam  
 13 to 18 inches—dark yellowish brown loam  
 18 to 36 inches—yellowish brown clay loam  
 36 to 49 inches—light olive brown, mottled clay loam  
 49 to 60 inches—yellowish brown, mottled loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet



**Inclusions***Contrasting inclusions:*

- The well drained Billett soils along the lower side slopes of low hills
- The excessively drained Boone soils along the lower side slopes of low hills
- The poorly drained Tripoli soils in drainageways

*Similar soils:*

- Soils that have a surface layer of loam

**Use and Management***Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 5A

**99C—Racine silt loam, 6 to 12 percent slopes****Composition**

Racine soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Side slopes of low hills on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 2 to 8 acres

**Typical Profile**

0 to 8 inches—very dark brown silt loam

8 to 22 inches—dark yellowish brown loam

22 to 36 inches—yellowish brown loam

36 to 60 inches—brown, mottled loam

**Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places

**Inclusions***Contrasting inclusions:*

- The well drained Billett and excessively drained Boone soils in landscape positions similar to those of the Racine soil
- Areas of soils that have a gravelly surface layer

*Similar soils:*

- Soils that have a surface layer of loam
- Soils that are underlain by sandstone bedrock at a depth of 40 to 60 inches

**Use and Management***Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 5A

**103A—Seaton silt loam, 1 to 3 percent slopes****Composition**

Seaton soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane or slightly convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 15 acres

**Typical Profile**

0 to 8 inches—very dark grayish brown silt loam

8 to 12 inches—dark grayish brown and grayish brown silt loam

12 to 35 inches—dark brown and dark yellowish brown silt loam

35 to 45 inches—dark yellowish brown and yellowish brown silt loam

45 to 60 inches—yellowish brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate or moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Sinkholes in places

### **Inclusions**

*Contrasting inclusions:*

- Somewhat poorly drained soils near the head of drainageways in the uplands

*Similar soils:*

- Moderately well drained soils in landscape positions similar to those of the Seaton soil

### **Use and Management**

*Cropland:*

- Minimum tillage reduces the hazard of erosion.
- Applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

## **103B—Seaton silt loam, 3 to 6 percent slopes**

### **Composition**

Seaton soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 40 acres

### **Typical Profile**

0 to 7 inches—dark grayish brown silt loam

7 to 10 inches—dark grayish brown and dark brown silt loam

10 to 33 inches—dark brown and dark yellowish brown silt loam

33 to 45 inches—dark yellowish brown and yellowish brown silt loam

45 to 60 inches—yellowish brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Gale, NewGlarus, Nodine, Rollingstone, and Southridge soils, which are in landscape positions similar to those of the Seaton soil and formed in thinner deposits of loess

*Similar soils:*

- Soils that are 40 to 60 inches deep over sandstone or limestone
- Soils that are 40 to 60 inches deep over bedrock residuum

### **Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

## **103C—Seaton silt loam, 6 to 12 percent slopes**

### **Composition**

Seaton soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Convex or plane areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 4 to 50 acres

### **Typical Profile**

0 to 8 inches—dark grayish brown silt loam

8 to 31 inches—dark yellowish brown silt loam

31 to 39 inches—yellowish brown silt loam

39 to 60 inches—yellowish brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Severely eroded in the strongly convex areas; dissected by narrow drainageways at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Dunbarton, NewGlarus, Nodine, Rollingstone, and Southridge soils in landscape positions similar to those of the Seaton soil
- The well drained and moderately well drained Eitzen soils in drainageways

*Similar soils:*

- Well drained, silty soils, which are in landscape positions similar to those of the Seaton soil and are underlain by bedrock at a depth of 40 to 60 inches
- Moderately well drained, silty soils, which are in landscape positions similar to those of the Seaton soil and are mottled below a depth of 30 inches

### **Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4A

## **103D—Seaton silt loam, 12 to 20 percent slopes**

### **Composition**

Seaton soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 20 acres

### **Typical Profile**

0 to 7 inches—dark brown silt loam

7 to 25 inches—dark brown and dark yellowish brown silt loam

25 to 35 inches—dark yellowish brown and yellowish brown silt loam

35 to 53 inches—yellowish brown silt loam

53 to 60 inches—yellowish brown and pale brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Severely eroded in the strongly convex areas; dissected by narrow drainageways

### **Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Dunbarton, NewGlarus, Nodine, Rollingstone, and Southridge soils in landscape positions similar to those of the Seaton soil
- The well drained and moderately well drained Eitzen soils in drainageways

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Well drained, silty soils, which are in landscape positions similar to those of the Seaton soil and are underlain by bedrock or material weathered from bedrock at a depth of 40 to 60 inches
- Moderately well drained, silty soils, which are in landscape positions similar to those of the Seaton soil and are mottled below a depth of 30 inches

### **Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and



strip cropping reduce the hazard of erosion.

- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.

### **Interpretive Groups**

*Land capability classification:* IVe

*Woodland ordination symbol:* 4R

## **173F—Frontenac loam, 30 to 40 percent slopes**

### **Composition**

Frontenac soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 20 acres

### **Typical Profile**

0 to 7 inches—very dark brown loam

7 to 15 inches—dark brown loam

15 to 27 inches—yellowish brown loam

27 to 36 inches—yellowish brown very cobbly silt loam

36 to 42 inches—light olive brown extremely cobbly silt loam

42 to 60 inches—light yellowish brown extremely cobbly silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, moderately rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or high

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Common colluvial stones and cobbles on the surface; dissected by narrow drainageways and gullies at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained or moderately well drained Beaver Creek soils, which are near or in drainageways
- The very steep, excessively drained Brodale and well drained Lacrescent soils on the steeper sides of ridges
- The well drained Lindstrom soils on the lower foot slopes

*Similar soils:*

- Soils that have a sandy surface layer

### **Use and Management**

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the slope.
- The hazard of erosion can be reduced by limiting surface disturbance.
- Planting vigorous nursery stock and increasing the planting rate reduce seedling mortality.

### **Interpretive Groups**

*Land capability classification:* VIIe

*Woodland ordination symbol:* 4R

## **174D—Gale silt loam, 12 to 20 percent slopes**

### **Composition**

Gale soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 2 to 60 acres

### **Typical Profile**

0 to 10 inches—dark grayish brown silt loam

10 to 31 inches—dark yellowish brown and yellowish brown silt loam

31 to 34 inches—yellowish brown loam

34 to 37 inches—yellowish brown fine sand

37 to 60 inches—yellowish brown, weakly cemented sandstone

### **Soil Properties and Qualities**

*Depth class:* Moderately deep

*Drainage class:* Well drained



*Permeability:* Moderate in the upper part, rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Cobbles on the surface and sandstone rock outcrop in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Seaton soils in the lower concave positions
- The excessively drained Boone soils on the steeper part of side slopes near areas of sandstone rock outcrop

*Similar soils:*

- Soils that have a surface layer of loam

### ***Use and Management***

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.

### ***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* 5R

## **176—Garwin silt loam**

### ***Composition***

Garwin soil and similar soils: 96 to 98 percent

Contrasting inclusions: 2 to 4 percent

### ***Setting***

*Landform and position on the landform:* Drainageways on terraces and uplands

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 9 inches—black silt loam

9 to 16 inches—black silty clay loam

16 to 39 inches—very dark gray silty clay loam

39 to 46 inches—olive gray silt loam

46 to 60 inches—light olive gray, mottled silt loam

## ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* High

*Surface runoff:* Slow

*Depth to water table:* 1 to 2 feet

### ***Inclusions***

*Contrasting inclusions:*

- Very poorly drained soils in depressions

*Similar soils:*

- Soils that have a surface layer of silty clay loam

### ***Use and Management***

*Cropland:*

- Most of the climatically adapted crops can be grown if adequate drainage is provided.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Restricted use during wet periods helps to prevent compaction and improves tilth.

### ***Interpretive Groups***

*Land capability classification:* IIw

*Woodland ordination symbol:* Not assigned

## **194—Huntsville silt loam**

### ***Composition***

Huntsville soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Long and irregular

*Size of areas:* 5 to 80 acres

### ***Typical Profile***

0 to 12 inches—very dark grayish brown silt loam

12 to 27 inches—black silt loam

27 to 46 inches—very dark brown silt loam

46 to 50 inches—very dark grayish brown silt loam

50 to 60 inches—dark brown silt loam

## ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Available water capacity:* Very high  
*Organic matter content:* Moderate  
*Surface runoff:* Slow  
*Depth to water table:* 4 to 6 feet  
*Frequency of flooding:* Rare  
*Distinctive properties:* Scour channels that formed during flooding

### **Inclusions**

*Contrasting inclusions:*

- Frequently flooded soils on low flood plains
- The poorly drained and very poorly drained Otter soils in depressions on flood plains

*Similar soils:*

- Soils that have a surface layer of loam or fine sandy loam
- Occasionally flooded soils that have as much as 80 inches of recently deposited sediment; on many of the narrower flood plains

### **Use and Management**

*Cropland:*

- Planting should be delayed because of the rare flooding in early spring.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* I

*Woodland ordination symbol:* 11A

## **198C—Rollingstone silt loam, 3 to 12 percent slopes**

### **Composition**

Rollingstone soil and similar soils: 85 to 95 percent  
 Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Elongated

*Size of areas:* 3 to 10 acres

### **Typical Profile**

0 to 7 inches—dark grayish brown silt loam  
 7 to 15 inches—dark yellowish brown silt loam  
 15 to 60 inches—yellowish red cherty clay

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Stones consisting mostly of chert on the surface in places

### **Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Nodine, and Seaton soils on the flatter part of summits
- Dolomite limestone outcrop in the more sloping areas

*Similar soils:*

- Soils that have a surface layer of silty clay loam or clay
- Soils that are underlain by dolomite limestone within a depth of 60 inches

### **Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.
- Windthrow can be minimized by using harvesting methods that do not leave the remaining trees widely spaced.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4C

## **198D—Rollingstone silt loam, 12 to 20 percent slopes**

### **Composition**

Rollingstone soil and similar soils: 85 to 95 percent  
 Contrasting inclusions: 5 to 15 percent

**Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Narrow and long

*Size of areas:* 3 to 10 acres

**Typical Profile**

0 to 5 inches—dark grayish brown silt loam

5 to 10 inches—dark yellowish brown silt loam

10 to 60 inches—yellowish red cherty clay

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at irregular intervals; severely eroded in strongly convex areas

**Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Nodine, and Seaton soils in landscape positions similar to those of the Rollingstone soil
- The moderately well drained Eitzen soils in narrow drainageways
- Dolomite limestone outcrop in strongly sloping areas

*Similar soils:*

- Soils that have a surface layer of silty clay loam or clay

**Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.
- Excessive disturbance of the soil when trees are harvested or roads are built results in erosion, which increases the number of rock fragments exposed on the surface.

**Interpretive Groups**

*Land capability classification:* IVe

*Woodland ordination symbol:* 4R

**215B—Southridge silt loam, 2 to 6 percent slopes****Composition**

Southridge soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

**Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Elongated and irregular

*Size of areas:* 3 to 15 acres

**Typical Profile**

0 to 8 inches—dark grayish brown silt loam

8 to 20 inches—dark brown and brown silt loam

20 to 30 inches—yellowish brown silt loam

30 to 60 inches—strong brown clay

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places

**Inclusions**

*Contrasting inclusions:*

- The well drained Rollingstone and Nodine soils in the more sloping areas
- Somewhat poorly drained soils at the head of drainageways in the uplands
- The well drained Blackhammer soils in landscape positions similar to those of the Southridge soil

*Similar soils:*

- Soils that contain more clay in the upper part

**Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.



*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.

**Interpretive Groups***Land capability classification:* IIe*Woodland ordination symbol:* 6A**215C—Southridge silt loam, 6 to 12 percent slopes****Composition**

Southridge soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

**Setting***Landform and position on the landform:* Convex areas on uplands*Shape of areas:* Long and narrow*Size of areas:* 3 to 15 acres**Typical Profile**

0 to 9 inches—dark grayish brown silt loam

9 to 14 inches—dark brown and dark yellowish brown silt loam

14 to 29 inches—dark yellowish brown silt loam

29 to 60 inches—yellowish red clay

**Soil Properties and Qualities***Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate in the upper part, slow in the lower part*Available water capacity:* Moderate*Organic matter content:* Moderate or high*Surface runoff:* Medium*Depth to water table:* More than 6 feet*Distinctive properties:* Few stones on the surface in places; severely eroded in strongly convex areas**Inclusions***Contrasting inclusions:*

- The well drained Nodine and Rollingstone soils in the more sloping areas
- The moderately well drained Eitzen soils in some narrow drainageways
- The well drained Blackhammer soils in landscape positions similar to those of the Southridge soil

*Similar soils:*

- Soils that have a surface layer of silty clay loam

**Use and Management***Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.

**Interpretive Groups***Land capability classification:* IIIe*Woodland ordination symbol:* 6A**215D—Southridge silt loam, 12 to 20 percent slopes****Composition**

Southridge soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

**Setting***Landform and position on the landform:* Convex areas on uplands*Shape of areas:* Long and narrow*Size of areas:* 3 to 15 acres**Typical Profile**

0 to 8 inches—very dark grayish brown silt loam

8 to 16 inches—dark brown silt loam

16 to 28 inches—dark yellowish brown and yellowish brown silt loam

28 to 60 inches—reddish brown cherty clay

**Soil Properties and Qualities***Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate in the upper part, slow in the lower part*Available water capacity:* High*Organic matter content:* Moderate*Surface runoff:* Rapid*Depth to water table:* More than 6 feet*Distinctive properties:* Few stones on the surface in places; dissected by narrow drainageways at irregular intervals; severely eroded in strongly convex areas



### ***Inclusions***

#### *Contrasting inclusions:*

- The well drained Nodine and Rollingstone soils in the more sloping areas
- The moderately well drained Eitzen soils in some narrow drainageways
- The well drained Blackhammer soils in landscape positions similar to those of the Southridge soil

#### *Similar soils:*

- Soils that have a surface layer of silty clay loam

### ***Use and Management***

#### *Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

#### *Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.

### ***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* 6R

## **262B—Medary silt loam, 1 to 6 percent slopes**

### ***Composition***

Medary soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on terraces

*Shape of areas:* Irregular

*Size of areas:* 2 to 20 acres

### ***Typical Profile***

- 0 to 9 inches—dark grayish brown silt loam
- 9 to 13 inches—dark brown silty clay loam
- 13 to 20 inches—brown, mottled silty clay loam
- 20 to 38 inches—yellowish brown silty clay
- 38 to 56 inches—stratified, light olive brown silty clay loam and silt loam
- 56 to 60 inches—stratified, light brownish gray silty clay loam and silt loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate or moderately slow in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderately low

*Surface runoff:* Medium

*Depth to water table:* 2.5 to 6.0 feet

### ***Inclusions***

#### *Contrasting inclusions:*

- Poorly drained, clayey soils in slight depressions

#### *Similar soils:*

- Soils that have a surface layer of silty clay loam

### ***Use and Management***

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

#### *Woodland:*

- Planting vigorous nursery stock and increasing the planting rate reduce seedling mortality.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- The hazard of erosion can be reduced by limiting surface disturbance.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* 4D

## **271—Minneiska fine sandy loam, channeled**

### ***Composition***

Minneiska soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular and elongated

*Size of areas:* 3 to 30 acres

### ***Typical Profile***

- 0 to 8 inches—very dark brown fine sandy loam
- 8 to 46 inches—stratified very dark grayish brown and

brown silt loam, loam, sandy loam, fine sandy loam, and fine sand

46 to 60 inches—stratified very dark grayish brown and dark grayish brown fine sand and loamy fine sand

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderately rapid in the upper part, rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* High

*Surface runoff:* Slow

*Depth to water table:* 3 to 6 feet

*Frequency of flooding:* Frequent

*Distinctive properties:* Dissected at irregular intervals by channels and depressions 1 to 3 feet deep; ponded areas that are remnants of previously existing channels throughout the unit

### **Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils in narrow side channels
- Poorly drained, sandy, alluvial soils adjacent to stream channels

*Similar soils:*

- Soils that have a surface layer of sandy loam

### **Use and Management**

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* Vw

*Woodland ordination symbol:* 9A

## **283B—Plainfield sand, 1 to 6 percent slopes**

### **Composition**

Plainfield soil and similar soils: 97 to 99 percent

Contrasting inclusions: 1 to 3 percent

### **Setting**

*Landform and position on the landform:* Plane areas on terraces

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### **Typical Profile**

0 to 8 inches—dark brown sand

8 to 31 inches—yellowish brown sand

31 to 60 inches—brownish yellow and light yellowish brown sand

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Available water capacity:* Low

*Organic matter content:* Low or moderately low

*Surface runoff:* Slow

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The well drained Billett soils on concave foot slopes

*Similar soils:*

- Soils that have a surface layer of loamy sand or sandy loam

### **Use and Management**

*Cropland:*

- Applying a system of minimum tillage and maintaining crop residue on the surface reduce the hazard of erosion.
- The best suited crops are those that can withstand drought.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

*Woodland:*

- The use of wheeled equipment may be limited because of the sand.
- Planting drought-tolerant seedlings, mulching, and shading the seedlings reduce the seedling mortality rate. Replanting generally is needed in some areas.

### **Interpretive Groups**

*Land capability classification:* IVs

*Woodland ordination symbol:* 9S

## **283C—Plainfield sand, 6 to 12 percent slopes**

### **Composition**

Plainfield soil and similar soils: 98 to 99 percent

Contrasting inclusions: 1 to 2 percent

### **Setting**

*Landform and position on the landform:* Convex to concave areas on terraces and uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### **Typical Profile**

0 to 8 inches—dark brown sand

8 to 31 inches—yellowish brown sand

31 to 45 inches—brownish yellow sand

45 to 60 inches—light yellowish brown sand

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Available water capacity:* Low

*Organic matter content:* Moderately low or low

*Surface runoff:* Slow

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The well drained Billett soils on foot slopes

*Similar soils:*

- Soils that have a surface layer of sandy loam

### **Use and Management**

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

*Woodland:*

- The use of wheeled equipment may be limited because of the sand.
- Planting drought-tolerant seedlings, mulching, and shading the seedlings reduce the seedling mortality rate. Replanting generally is needed in some areas.

### **Interpretive Groups**

*Land capability classification:* VIs

*Woodland ordination symbol:* 9S

## **283D—Plainfield sand, 12 to 25 percent slopes**

### **Composition**

Plainfield soil and similar soils: 98 to 99 percent

Contrasting inclusions: 1 to 2 percent

### **Setting**

*Landform and position on the landform:* Plane or convex areas on terraces and uplands

*Shape of areas:* Irregular and elongated

*Size of areas:* 5 to 20 acres

### **Typical Profile**

0 to 4 inches—very dark grayish brown sand

4 to 31 inches—yellowish brown sand

31 to 60 inches—brownish yellow and light yellowish brown sand

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Available water capacity:* Low

*Organic matter content:* Low or moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways or shallow gullies at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained Abscota Variant soils in drainageways

*Similar soils:*

- Soils that have a surface layer of sandy loam or loamy sand

### **Use and Management**

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment may be limited because of the slope and the sand.
- Planting drought-tolerant seedlings, mulching, and shading the seedlings reduce the seedling mortality rate. Replanting generally is needed in some areas.

### **Interpretive Groups**

*Land capability classification:* VIIIs

*Woodland ordination symbol:* 9R

## **283F—Plainfield sand, 25 to 50 percent slopes**

### **Composition**

Plainfield soil and similar soils: 98 to 99 percent

Contrasting inclusions: 1 to 2 percent

### **Setting**

*Landform and position on the landform:* Plane or convex areas on terraces and uplands



*Shape of areas:* Irregular and elongated

*Size of areas:* 5 to 20 acres

### **Typical Profile**

0 to 3 inches—very dark grayish brown sand

3 to 6 inches—dark brown sand

6 to 34 inches—yellowish brown sand

34 to 60 inches—very pale brown sand

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Available water capacity:* Low

*Organic matter content:* Moderately low or low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways and some gullies at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained Abscota Variant soils in drainageways

*Similar soils:*

- Soils that have a surface layer of sandy loam or loamy sand

### **Use and Management**

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment may be limited because of the slope and the sand.
- Planting drought-tolerant seedlings, mulching, and shading the seedlings reduce the seedling mortality rate. Replanting generally is needed in some areas.

### **Interpretive Groups**

*Land capability classification:* VIIIs

*Woodland ordination symbol:* 9R

## **285A—Port Byron silt loam, 1 to 3 percent slopes**

### **Composition**

Port Byron soil and similar soils: 98 to 99 percent

Contrasting inclusions: 1 to 2 percent

### **Setting**

*Landform and position on the landform:* Plane areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 60 acres

### **Typical Profile**

0 to 10 inches—black silt loam

10 to 19 inches—black and very dark grayish brown silt loam

19 to 27 inches—dark brown silt loam

27 to 42 inches—dark yellowish brown and yellowish brown, mottled silt loam

42 to 60 inches—yellowish brown, mottled silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- Well drained or moderately well drained, silty soils that are underlain by bedrock at a depth of 40 to 60 inches
- The poorly drained Garwin soils in drainageways

*Similar soils:*

- Somewhat poorly drained soils at the head of drainageways

### **Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### **Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* Not assigned

## **285B—Port Byron silt loam, 3 to 6 percent slopes**

### **Composition**

Port Byron soil and similar soils: 98 to 99 percent

Contrasting inclusions: 1 to 2 percent



**Setting**

*Landform and position on the landform:* Slightly convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 120 acres

**Typical Profile**

0 to 9 inches—black silt loam

9 to 16 inches—black and very dark grayish brown silt loam

16 to 26 inches—dark brown and dark yellowish brown silt loam

26 to 33 inches—yellowish brown silt loam

33 to 60 inches—yellowish brown, mottled silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

**Inclusions**

*Contrasting inclusions:*

- The poorly drained Garwin soils in drainageways

*Similar soils:*

- Somewhat poorly drained soils at the head of drainageways in the uplands
- Soils that have a thicker surface layer; in drainageways

**Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

**Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* Not assigned

**285C—Port Byron silt loam, 6 to 12 percent slopes****Composition**

Port Byron soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Convex, plane, or concave areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 4 to 25 acres

**Typical Profile**

0 to 9 inches—very dark gray silt loam

9 to 13 inches—very dark grayish brown silt loam

13 to 30 inches—dark brown and dark yellowish brown silt loam

30 to 50 inches—dark yellowish brown and yellowish brown silt loam

50 to 60 inches—yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

**Inclusions**

*Contrasting inclusions:*

- Well drained soils that are underlain by limestone bedrock at a depth of 40 to 60 inches
- The well drained and moderately well drained Eitzen soils in drainageways

*Similar soils:*

- Soils that have a surface layer of loam

**Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

**Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* Not assigned

**299B—Rockton silt loam, 1 to 6 percent slopes****Composition**

Rockton soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

**Setting**

*Landform and position on the landform:* Plane areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 80 acres

**Typical Profile**

0 to 9 inches—black silt loam

9 to 13 inches—very dark grayish brown loam

13 to 22 inches—dark yellowish brown loam

22 to 27 inches—yellowish brown clay loam

27 inches—dolomite limestone bedrock

**Soil Properties and Qualities**

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Low

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Rock outcrop in places

**Inclusions**

*Contrasting inclusions:*

- Poorly drained soils near depressions
- Well drained soils that are underlain by gravelly sand or bedrock at a depth of 40 to 80 inches

*Similar soils:*

- Well drained soils that are less than 20 inches deep over bedrock; typically near areas of bedrock outcrop

**Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- The best suited crops are those that can withstand drought.
- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

**Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* Not assigned

**301A—Lindstrom silt loam, 1 to 3 percent slopes****Composition**

Lindstrom soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

**Setting**

*Landform and position on the landform:* Plane or concave areas on uplands

*Shape of areas:* Elongated

*Size of areas:* 3 to 20 acres

**Typical Profile**

0 to 30 inches—black silt loam

30 to 36 inches—very dark grayish brown silt loam

36 to 60 inches—dark brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

**Inclusions**

*Contrasting inclusions:*

- The moderately well drained Eitzen soils in drainageways
- The moderately well drained Festina and somewhat poorly drained Littleton soils near stream terraces of valleys in deeply dissected uplands
- The well drained Beaver Creek Variant soils near the head of deeply dissected uplands

*Similar soils:*

- Soils that have a surface layer of loam
- Soils that are underlain by sand at a depth of about 60 inches

**Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* Not assigned

## **301C—Lindstrom silt loam, 6 to 12 percent slopes**

### ***Composition***

Lindstrom soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Plane or concave areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 15 acres

### ***Typical Profile***

0 to 9 inches—very dark brown silt loam

9 to 16 inches—very dark brown silt loam

16 to 35 inches—very dark grayish brown and dark brown silt loam

35 to 60 inches—dark olive and light olive brown silt loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at irregular intervals

### ***Inclusions***

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek and Eitzen soils in narrow drainageways
- The well drained Eyota soils below areas of sandstone rock outcrop

*Similar soils:*

- Soils that have a surface layer of loam
- Moderately well drained soils that are mottled in the substratum
- Soils that have a surface soil that is less than 24 inches thick

### ***Use and Management***

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of

gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* Not assigned

## **301D—Lindstrom silt loam, 12 to 20 percent slopes**

### ***Composition***

Lindstrom soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Plane or concave areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 9 inches—black silt loam

9 to 27 inches—very dark grayish brown silt loam

27 to 52 inches—dark brown silt loam

52 to 60 inches—yellowish brown silt loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate or high

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at irregular intervals; few or common stones on the surface in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek and Eitzen soils in narrow drainageways
- The well drained Eyota soils below areas of sandstone rock outcrop

*Similar soils:*

- Soils that have a surface layer of loam
- Soils that have a surface layer 10 to 24 inches thick



### **Use and Management**

#### *Cropland:*

- Crop rotation, minimum tillage, and cover crops maintain or improve fertility.
- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### **Interpretive Groups**

*Land capability classification:* IVe

*Woodland ordination symbol:* Not assigned

## **322C2—Timula silt loam, 6 to 12 percent slopes, eroded**

### **Composition**

Timula soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and irregular

*Size of areas:* 5 to 10 acres

### **Typical Profile**

0 to 8 inches—dark brown silt loam

8 to 24 inches—dark yellowish brown silt loam

24 to 60 inches—light olive brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places; drainageways throughout the unit

### **Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Eitzen soils in drainageways
- The well drained Lindstrom soils near the head of drainageways

#### *Similar soils:*

- Soils that have a surface layer of loam
- Soils that have more clay in the subsoil

### **Use and Management**

#### *Cropland:*

- Crop rotation, minimum tillage, and cover crops maintain or improve fertility.
- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.
- Seedlings survive and grow well if competing vegetation is removed or controlled.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 5A

## **322D2—Timula silt loam, 12 to 20 percent slopes, eroded**

### **Composition**

Timula soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 7 acres

### **Typical Profile**

0 to 6 inches—dark grayish brown silt loam

6 to 20 inches—dark yellowish brown silt loam

20 to 30 inches—grayish brown, mottled silt loam

30 to 60 inches—light brownish gray silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Low

*Surface runoff:* Rapid



*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places; drainageways throughout the unit

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg and poorly drained and very poorly drained Newalbin soils in drainageways

*Similar soils:*

- Soils that have a substratum stratified with fine sandy loam, loamy fine sand, and fine sand

### ***Use and Management***

*Cropland:*

- Crop rotation, minimum tillage, and cover crops maintain or improve fertility.
- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- The use of equipment is limited because of the slope.
- The hazard of erosion can be reduced by limiting surface disturbance.
- Seedlings survive and grow well if competing vegetation is removed or controlled.

### ***Interpretive Groups***

*Land capability classification:* IVE

*Woodland ordination symbol:* 5R

## **322E2—Timula silt loam, 20 to 40 percent slopes, eroded**

### ***Composition***

Timula soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Convex areas and side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 9 inches—dark grayish brown silt loam

9 to 20 inches—dark yellowish brown silt loam

20 to 28 inches—dark yellowish brown, mottled silt loam

28 to 32 inches—grayish brown, mottled silt loam

32 to 60 inches—light brownish gray, mottled silt loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places; dissected by drainageways at irregular intervals

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg and poorly drained and very poorly drained Newalbin soils in drainageways

*Similar soils:*

- Soils that have a surface layer of loam
- Soils that have more clay in the surface layer and subsoil
- Soils that have sand at a depth of about 40 inches

### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the slope.
- The hazard of erosion can be reduced by limiting surface disturbance.
- Seedlings survive and grow well if competing vegetation is removed or controlled.

### ***Interpretive Groups***

*Land capability classification:* VIIe

*Woodland ordination symbol:* 5R

## **322F—Timula silt loam, 40 to 60 percent slopes**

### ***Composition***

Timula soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### ***Setting***

*Landform and position on the landform:* Side slopes and back slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### **Typical Profile**

0 to 5 inches—grayish brown silt loam

5 to 24 inches—light yellowish brown silt loam

24 to 60 inches—very pale brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by shallow gullies at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained Billett soils in the lower positions on the landscape
- The moderately well drained Chaseburg and poorly drained and very poorly drained Newalbin soils in drainageways

*Similar soils:*

- Soils that have a surface layer of loam

### **Use and Management**

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the dissected landscape.
- The hazard of erosion can be reduced by limiting surface disturbance.
- Seedlings survive and grow well if competing vegetation is removed or controlled.

### **Interpretive Groups**

*Land capability classification:* VIIe

*Woodland ordination symbol:* 5R

## **331—Tripoli silty clay loam**

### **Composition**

Tripoli soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### **Setting**

*Landform and position on the landform:* Plane or slightly concave areas on uplands

*Slope range:* 0 to 1 percent

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 20 acres

### **Typical Profile**

0 to 12 inches—black silty clay loam

12 to 16 inches—very dark gray silty clay loam

16 to 26 inches—dark gray silty clay loam

26 to 53 inches—olive gray loam

53 to 60 inches—gray, mottled loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* High

*Surface runoff:* Slow

*Depth to water table:* 1 to 2 feet

*Distinctive properties:* Scattered cobbles and boulders on the surface in places

### **Inclusions**

*Contrasting inclusions:*

- The poorly drained Marshan soils in some drainageways

*Similar soils:*

- Soils that have a surface layer of mucky silty clay loam
- Soils that have slowly permeable glacial till in the substratum
- Soils that have thin strata of sandy loam and loamy sand throughout

### **Use and Management**

*Cropland:*

- Most of the climatically adapted crops can be grown if adequate drainage and protection from flooding are provided.
- Seasonal wetness limits crop production.

*Pasture and forage:*

- Grazing when the soil is wet results in compaction of the surface layer and poor tilth.

### **Interpretive Groups**

*Land capability classification:* IIw

*Woodland ordination symbol:* Not assigned

### 369B—Waubeeek silt loam, 2 to 6 percent slopes

#### **Composition**

Waubeeek soil and similar soils: 95 to 98 percent  
Contrasting inclusions: 2 to 5 percent

#### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 10 acres

#### **Typical Profile**

0 to 9 inches—dark grayish brown silt loam  
9 to 15 inches—yellowish brown silt loam  
15 to 26 inches—brown silty clay loam  
26 to 31 inches—strong brown sandy clay loam  
31 to 45 inches—yellowish brown loam  
45 to 60 inches—light yellowish brown loam

#### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

#### **Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Gale, and NewGlarus soils in landscape positions similar to those of the Waubeeek soil

*Similar soils:*

- Somewhat poorly drained soils near drainageways

#### **Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Returning crop residue to the soil helps to maintain tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

### 369C—Waubeeek silt loam, 6 to 12 percent slopes

#### **Composition**

Waubeeek soil and similar soils: 90 to 95 percent  
Contrasting inclusions: 5 to 10 percent

#### **Setting**

*Landform and position on the landform:* Convex and plane areas on ridgetops in the uplands

*Shape of areas:* Narrow and irregular

*Size of areas:* 2 to 10 acres

#### **Typical Profile**

0 to 8 inches—dark grayish brown silt loam  
8 to 32 inches—yellowish brown silt loam and silty clay loam  
32 to 60 inches—yellowish brown loam

#### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Severely eroded in some convex areas

#### **Inclusions**

*Contrasting inclusions:*

- The well drained Blackhammer, Gale, and NewGlarus soils in landscape positions similar to those of the Waubeeek soil

*Similar soils:*

- Soils that have a surface layer of silty clay loam

#### **Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.
- Returning crop residue to the soil helps to maintain tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4A

**388C—Seaton silt loam, valleys, 6 to 12 percent slopes****Composition**

Seaton soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane, convex, and concave areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 20 acres

**Typical Profile**

0 to 5 inches—very dark grayish brown silt loam

5 to 12 inches—dark brown silt loam

12 to 24 inches—dark brown and dark yellowish brown silt loam

24 to 50 inches—yellowish brown silt loam

50 to 60 inches—yellowish brown and pale brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at irregular intervals; severely eroded in strongly convex areas

**Inclusions**

*Contrasting inclusions:*

- The moderately well drained Chaseburg soils in narrow drainageways

*Similar soils:*

- Soils that have a surface layer of loam

**Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by

shaping and seeding natural drainageways.

- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 5A

**388D—Seaton silt loam, valleys, 12 to 20 percent slopes****Composition**

Seaton soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane or concave areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 40 acres

**Typical Profile**

0 to 9 inches—dark brown silt loam

9 to 21 inches—dark brown and dark yellowish brown silt loam

21 to 50 inches—dark yellowish brown and yellowish brown silt loam

50 to 60 inches—yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at irregular intervals; severely eroded in strongly sloping areas

**Inclusions**

*Contrasting inclusions:*

- The moderately well drained Chaseburg soils in narrow drainageways



*Similar soils:*

- Soils that have a surface layer of loam

***Use and Management****Cropland:*

- Crop rotation, minimum tillage, and cover crops maintain or improve fertility.
- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Grazing when the soil is wet results in compaction of the surface layer and poor tilth.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.
- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.

***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* 5R

**388E—Seaton silt loam, valleys, 20 to 30 percent slopes*****Composition***

Seaton soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

***Setting***

*Landform and position on the landform:* Plane or slightly concave areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 40 acres

***Typical Profile***

0 to 6 inches—very dark grayish brown silt loam

6 to 10 inches—very dark grayish brown and dark brown silt loam

10 to 21 inches—dark brown silt loam

21 to 35 inches—dark brown and dark yellowish brown silt loam

35 to 60 inches—dark yellowish brown and yellowish brown silt loam

***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by gullies and narrow drainageways at irregular intervals; colluvium consisting of scattered stones and boulders on the surface in places

***Inclusions****Contrasting inclusions:*

- The moderately well drained Chaseburg and well drained and moderately well drained Beaver Creek soils in narrow drainageways
- The well drained Norden soils in strongly convex areas or on ridges

*Similar soils:*

- Soils that have a surface layer of loam or sandy loam

***Use and Management****Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

*Woodland:*

- The use of equipment is limited because of the slope.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.
- The hazard of erosion can be reduced by limiting surface disturbance.

***Interpretive Groups***

*Land capability classification:* VIe

*Woodland ordination symbol:* 5R

**401B—Mt. Carroll silt loam, 3 to 6 percent slopes*****Composition***

Mt. Carroll soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

***Setting***

*Landform and position on the landform:* Plane or slightly convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 40 acres

**Typical Profile**

0 to 8 inches—very dark grayish brown silt loam  
 8 to 14 inches—dark grayish brown silt loam  
 14 to 39 inches—dark brown and dark yellowish brown silt loam  
 39 to 54 inches—yellowish brown silt loam  
 54 to 60 inches—yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Available water capacity:* Very high  
*Organic matter content:* Moderate  
*Surface runoff:* Medium  
*Depth to water table:* More than 6 feet  
*Distinctive properties:* Dissected by drainageways in places

**Inclusions**

*Contrasting inclusions:*

- Somewhat poorly drained soils in drainageways and in concave areas on head slopes above drainageways

*Similar soils:*

- Moderately well drained soils on summits

**Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 5A

**401C—Mt. Carroll silt loam, 6 to 12 percent slopes****Composition**

Mt. Carroll soil and similar soils: 85 to 90 percent  
 Contrasting inclusions: 10 to 15 percent

**Setting**

*Landform and position on the landform:* Plane or convex areas on uplands

*Shape of areas:* Narrow and elongated

*Size of areas:* 4 to 30 acres

**Typical Profile**

0 to 8 inches—very dark grayish brown silt loam  
 8 to 14 inches—dark brown silt loam  
 14 to 30 inches—brown silt loam  
 30 to 60 inches—yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderate  
*Available water capacity:* Very high  
*Organic matter content:* Moderate  
*Surface runoff:* Medium  
*Depth to water table:* More than 6 feet  
*Distinctive properties:* Severely eroded in convex areas; dissected by narrow drainageways at irregular intervals

**Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Eitzen soils in drainageways

*Similar soils:*

- Moderately well drained soils on side slopes

**Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 5A

**401D—Mt. Carroll silt loam, 12 to 20 percent slopes****Composition**

Mt. Carroll soil and similar soils: 95 to 98 percent  
 Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Convex or plane areas on uplands

*Shape of areas:* Elongated

*Size of areas:* 4 to 20 acres

**Typical Profile**

0 to 7 inches—very dark grayish brown silt loam

7 to 11 inches—dark grayish brown silt loam

11 to 30 inches—dark brown and brown silt loam

30 to 55 inches—brown and yellowish brown silt loam

55 to 60 inches—yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at regular intervals; subsoil exposed by erosion in places

**Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Eitzen soils in drainageways

*Similar soils:*

- Moderately well drained soils on side slopes

**Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

*Woodland:*

- The use of equipment is limited because of the slope.
- The hazard of erosion can be reduced by limiting surface disturbance.
- Seedlings survive and grow well if competing vegetation is removed or controlled.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* IVe

*Woodland ordination symbol:* 5R

**455A—Festina silt loam, 0 to 2 percent slopes****Composition**

Festina soil and similar soils: 96 to 98 percent

Contrasting inclusions: 2 to 4 percent

**Setting**

*Landform and position on the landform:* Plane areas on terraces

*Shape of areas:* Irregular

*Size of areas:* 5 to 50 acres

**Typical Profile**

0 to 7 inches—very dark grayish brown silt loam

7 to 11 inches—brown silt loam

11 to 14 inches—dark yellowish brown silt loam

14 to 32 inches—yellowish brown silt loam

32 to 53 inches—light olive brown, mottled silt loam

53 to 60 inches—light olive brown and yellowish brown, mottled silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Slow

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways

**Inclusions**

*Contrasting inclusions:*

- The somewhat poorly drained Littleton soils in concave areas

*Similar soils:*

- Well drained soils that are underlain by sand at a depth of about 40 inches

**Use and Management**

*Cropland:*

- Returning crop residue to the soil helps to maintain tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.



### ***Interpretive Groups***

*Land capability classification:* I

*Woodland ordination symbol:* 4A

## **455B—Festina silt loam, 2 to 6 percent slopes**

### ***Composition***

Festina soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### ***Setting***

*Landform and position on the landform:* Plane, convex, or concave areas on terraces

*Shape of areas:* Irregular

*Size of areas:* 3 to 12 acres

### ***Typical Profile***

0 to 10 inches—dark grayish brown silt loam

10 to 35 inches—brown and dark yellowish brown silt loam and silty clay loam

35 to 48 inches—brown, mottled silt loam

48 to 60 inches—light grayish brown silt loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

### ***Inclusions***

*Contrasting inclusions:*

- The poorly drained Garwin soils in narrow drainageways and shallow depressions

*Similar soils:*

- Well drained soils underlain by sand at a depth of about 40 inches

### ***Use and Management***

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Returning crop residue to the soil helps to maintain tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

## **457E—Lacrescent channery silt loam, 20 to 45 percent slopes**

### ***Composition***

Lacrescent soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 8 inches—black and very dark grayish brown channery silt loam

8 to 15 inches—yellowish brown very flaggy silt loam

15 to 48 inches—brown flaggy loam

48 to 60 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately rapid in the upper part, moderately rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderate or high

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dolomite limestone outcrop in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Lindstrom soils on the lower foot slopes
- The somewhat excessively drained Sogn soils on the upper part of slopes

*Similar soils:*

- Soils that have a surface layer of silt loam, silty clay loam, or loam
- Soils that are cobbly throughout or have a flaggy surface layer

### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality



and quantity of forage, especially on the steeper slopes.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope and stoniness.

***Interpretive Groups***

*Land capability classification:* VIe

*Woodland ordination symbol:* 2R

**457G—Lacrescent silt loam, rocky, 45 to 70 percent slopes**

***Composition***

Lacrescent soil and similar soils: 75 to 85 percent

Contrasting inclusions: 15 to 25 percent

***Setting***

*Landform and position on the landform:* Plane or convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 100 acres

***Typical Profile***

0 to 10 inches—black silt loam

10 to 18 inches—dark brown cobbly silt loam

18 to 32 inches—brown and yellowish brown very cobbly silt loam

32 to 60 inches—yellowish brown very cobbly silt loam

***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately rapid in the upper part, moderately rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderate or high

*Surface runoff:* Very rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Areas of dolomite limestone outcrop as much as 20 feet wide on the upper part of slopes; dissected by numerous gullies and drainageways at irregular intervals; numerous channer- to boulder-sized fragments scattered on the surface

***Inclusions***

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils in drainageways
- The well drained Elbaville and Seaton soils on the lower foot slopes

• The excessively drained Boone soils on very steep side slopes

• Lamoille and Dorerton soils on the upper shoulder slopes or on the less steep side slopes along drainageways

*Similar soils:*

- Soils having a surface layer that has fragments

***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope and stoniness.

***Interpretive Groups***

*Land capability classification:* VIIe

*Woodland ordination symbol:* 2R

**468—Otter silt loam**

***Composition***

Otter soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

***Setting***

*Landform and position on the landform:* Plane or concave areas on flood plains

*Slope range:* 0 to 1 percent

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 20 acres

***Typical Profile***

0 to 15 inches—black silt loam

15 to 28 inches—very dark gray silt loam

28 to 37 inches—dark gray, mottled silt loam

37 to 60 inches—greenish gray, mottled silt loam

***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Poorly drained and very poorly drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Very high or high

*Surface runoff:* Slow or ponded

*Depth to water table:* 0 to 2 feet

*Frequency of flooding:* Rare

***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg soils in landscape positions similar to those of the Otter soil

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Poorly drained, sandy soils near stream channels
- Poorly drained soils that have silty overwash
- Poorly drained and very poorly drained soils underlain by sand at a depth of 40 inches
- Somewhat poorly drained soils

**Use and Management***Cropland:*

- Most of the climatically adapted crops can be grown if adequate drainage and protection from flooding are provided.
- The rare flooding limits crop production.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Restricted use during wet periods helps to prevent compaction and improves tilth.

**Interpretive Groups***Land capability classification:* IIw*Woodland ordination symbol:* Not assigned**474B—Haverhill mucky silty clay loam, 1 to 8 percent slopes****Composition**

Haverhill soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

**Setting***Landform and position on the landform:* Plane areas on uplands*Shape of areas:* Long and narrow*Size of areas:* 2 to 15 acres**Typical Profile**

- 0 to 4 inches—black mucky silty clay loam
- 4 to 9 inches—black silty clay loam
- 9 to 14 inches—very dark gray silty clay loam
- 14 to 30 inches—olive gray, mottled clay
- 30 to 60 inches—greenish gray and pale green, mottled clay

**Soil Properties and Qualities***Depth class:* Moderately deep*Drainage class:* Very poorly drained*Permeability:* Moderately slow in the upper part, slow or very slow in the lower part*Available water capacity:* Low*Organic matter content:* Very high or high*Surface runoff:* Medium or slow*Depth to water table:* 0 to 1 foot*Distinctive properties:* Hillside seeps and springs and few scattered flagstones on the surface in places**Inclusions***Contrasting inclusions:*

- The excessively drained Sogn and Brodale and well drained Lacrescent soils in the slightly higher positions on the landscape

*Similar soils:*

- Soils that have a mucky surface layer

**Use and Management***Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Restricted use during wet periods helps to prevent compaction and improves tilth.

**Interpretive Groups***Land capability classification:* VIw*Woodland ordination symbol:* Not assigned**476B—Frankville silt loam, 2 to 6 percent slopes****Composition**

Frankville soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting***Landform and position on the landform:* Plane areas on uplands*Shape of areas:* Irregular*Size of areas:* 3 to 20 acres**Typical Profile**

- 0 to 7 inches—very dark brown silt loam
- 7 to 12 inches—yellowish brown silt loam
- 12 to 19 inches—dark yellowish brown silt loam
- 19 to 24 inches—yellowish brown silt loam
- 24 to 34 inches—yellowish brown clay
- 34 to 38 inches—yellowish brown extremely flaggy clay
- 38 inches—fractured dolomite limestone

**Soil Properties and Qualities***Depth class:* Moderately deep*Drainage class:* Well drained*Permeability:* Moderate in the upper part, slow in the lower part*Available water capacity:* Moderate*Organic matter content:* Moderate*Surface runoff:* Medium*Depth to water table:* More than 6 feet

### ***Inclusions***

#### *Contrasting inclusions:*

- The moderately well drained Keltner soils on butte-like hills near areas of shale outcrop
- The well drained Port Byron soils near summits

#### *Similar soils:*

- Soils that have a surface layer of loam
- Well drained soils that are underlain by hard bedrock at a depth of more than 40 inches

### ***Use and Management***

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Returning crop residue to the soil helps to maintain tilth.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

## **476C—Frankville silt loam, 6 to 12 percent slopes**

### ***Composition***

Frankville soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 8 inches—very dark brown silt loam

8 to 26 inches—dark yellowish brown and yellowish brown silt loam

26 to 36 inches—yellowish brown very flaggy clay

36 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Exposed benches or channers and flagstones on the surface in places

### ***Inclusions***

#### *Contrasting inclusions:*

- The moderately well drained Keltner soils near areas of shale outcrop
- The well drained Port Byron and Mt. Carroll soils in the lower, concave positions on the landscape

#### *Similar soils:*

- Soils that have a surface layer of loam
- Well drained soils that are underlain by hard bedrock at a depth of more than 40 inches

### ***Use and Management***

#### *Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.
- Returning crop residue to the soil helps to maintain tilth.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4A

## **476D—Frankville silt loam, 12 to 18 percent slopes**

### ***Composition***

Frankville soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 7 inches—very dark grayish brown silt loam

7 to 25 inches—dark brown and yellowish brown silt loam

25 to 35 inches—yellowish brown extremely flaggy silt loam

35 to 60 inches—hard limestone bedrock

### **Soil Properties and Qualities**

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places

### **Inclusions**

*Contrasting inclusions:*

- The well drained Port Byron and Mt. Carroll soils on side slopes

*Similar soils:*

- Soils that have a surface layer of channery silt loam or flaggy silt loam
- Soils that have slopes of more than 18 percent

### **Use and Management**

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.
- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.

### **Interpretive Groups**

*Land capability classification:* V1e

*Woodland ordination symbol:* 4R

## **477—Littleton silt loam**

### **Composition**

Littleton soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### **Setting**

*Landform and position on the landform:* Plane or concave areas on terraces

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 5 to 20 acres

### **Typical Profile**

0 to 8 inches—black silt loam

8 to 35 inches—very dark brown silt loam

35 to 48 inches—dark brown, mottled silt loam

48 to 60 inches—light brownish gray, mottled silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Slow

*Depth to water table:* 1 to 3 feet

*Distinctive properties:* Flooding in some areas

### **Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Eitzen soils near stream channels or in drainageways in the uplands
- The poorly drained Garwin soils in depressions

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Well drained soils on some low terraces
- Somewhat poorly drained soils underlain by sand at a depth of 40 to 60 inches

### **Use and Management**

*Cropland:*

- Returning crop residue to the soil helps to maintain tilth.
- Seasonal wetness limits crop production.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Restricted use during wet periods helps to prevent compaction and improves tilth.

### **Interpretive Groups**

*Land capability classification:* I

*Woodland ordination symbol:* Not assigned

## **483—Waukee loam**

### **Composition**

Waukee soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Plane, slightly concave, or convex areas on terraces



*Slope range:* 1 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 5 to 50 acres

### **Typical Profile**

0 to 10 inches—black loam

10 to 21 inches—very dark brown loam

21 to 36 inches—dark brown loam

36 to 42 inches—yellowish brown gravelly loamy sand

42 to 60 inches—stratified yellowish brown and dark brown sandy loam and fine sand

### **Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, very rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Slow or medium

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The somewhat poorly drained Lawler soils at the slightly lower elevations
- The somewhat excessively drained Flagler soils in slightly convex areas

*Similar soils:*

- Soils that have a surface layer of sandy loam

### **Use and Management**

*Cropland:*

- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### **Interpretive Groups**

*Land capability classification:* IIs

*Woodland ordination symbol:* Not assigned

## **484D—Eyota fine sandy loam, 12 to 20 percent slopes**

### **Composition**

Eyota soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Plane or concave areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 20 acres

### **Typical Profile**

0 to 20 inches—very dark brown fine sandy loam

20 to 26 inches—dark brown fine sandy loam

26 to 48 inches—very dark brown loam

48 to 57 inches—dark brown silt loam

57 to 60 inches—dark yellowish brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid in the upper part, moderate in the lower part

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by drainageways at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained Lindstrom soils on the lower part of foot slopes
- The well drained Spinks soils near areas of sandstone rock outcrop

*Similar soils:*

- Soils that have a surface layer of loam
- Well drained soils that have a sandy surface layer; on the upper foot slopes

### **Use and Management**

*Cropland:*

- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.
- Minimum tillage and contour farming reduce the hazard of erosion.

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

### **Interpretive Groups**

*Land capability classification:* IVe

*Woodland ordination symbol:* Not assigned

## 488G—Brodale cobbly loam, rocky, 45 to 70 percent slopes

### **Composition**

Brodale soil and similar soils: 85 to 95 percent  
Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 10 to 200 acres

### **Typical Profile**

0 to 7 inches—very dark grayish brown cobbly loam  
7 to 15 inches—very dark grayish brown very cobbly silt loam  
15 to 60 inches—brown very cobbly loam

### **Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Excessively drained

*Permeability:* Moderate in the upper part, moderate or moderately rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderate or high

*Surface runoff:* Very rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by rock outcrop and gullies at irregular intervals

### **Inclusions**

*Contrasting inclusions:*

- The well drained Frontenac soils on the lower foot slopes
- The excessively drained Boone soils near areas of sandstone rock outcrop
- The somewhat excessively drained Sogn soils on the top and upper part of ridges

*Similar soils:*

- Soils that have a surface layer of loam

### **Use and Management**

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

### **Interpretive Groups**

*Land capability classification:* VIIs

*Woodland ordination symbol:* Not assigned

## 492B—Nasset silt loam, 3 to 6 percent slopes

### **Composition**

Nasset soil and similar soils: 95 to 98 percent  
Contrasting inclusions: 2 to 5 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 20 acres

### **Typical Profile**

0 to 7 inches—very dark grayish brown silt loam  
7 to 11 inches—dark brown silt loam  
11 to 23 inches—dark yellowish brown silt loam  
23 to 37 inches—yellowish brown silt loam  
37 to 45 inches—yellowish brown clay  
45 to 60 inches—light olive brown extremely flaggy clay

### **Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The moderately well drained Keltner soils near areas of shale outcrop

*Similar soils:*

- Soils that are underlain by dolomite limestone at a depth of 40 to 60 inches

### **Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Returning crop residue to the soil helps to maintain tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

## 492C—Nasset silt loam, 6 to 12 percent slopes

### **Composition**

Nasset soil and similar soils: 95 to 99 percent  
Contrasting inclusions: 1 to 5 percent

### **Setting**

*Landform and position on the landform:* Plane or convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 15 acres

### **Typical Profile**

0 to 9 inches—very dark grayish brown silt loam  
9 to 15 inches—dark brown silt loam  
15 to 30 inches—dark yellowish brown silt loam  
30 to 45 inches—yellowish brown silt loam  
45 to 54 inches—yellowish brown clay  
54 to 60 inches—very flaggy clay and fractured dolomite limestone

### **Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in parts of convex areas

### **Inclusions**

*Contrasting inclusions:*

- The moderately well drained Keltner soils on side slopes near areas of shale outcrop
- The well drained Dunbarton soils in landscape positions similar to those of the Nasset soil

*Similar soils:*

- Soils that have a surface layer of silty clay loam

### **Use and Management**

*Cropland:*

- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.
- Minimum tillage and contour farming reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4A

## 493B—Oronoco fine sandy loam, 3 to 8 percent slopes

### **Composition**

Oronoco soil and similar soils: 85 to 95 percent  
Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex areas on summits and side slopes in the uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 20 acres

### **Typical Profile**

0 to 8 inches—very dark grayish brown fine sandy loam  
8 to 12 inches—dark grayish brown fine sandy loam  
12 to 17 inches—brown fine sandy loam  
17 to 53 inches—yellowish brown fine sandy loam  
53 to 60 inches—yellowish brown, stratified silt loam and fine sandy loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid in the upper part, moderate in the lower part

*Available water capacity:* High

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion on parts of side slopes

### **Inclusions**

*Contrasting inclusions:*

- The well drained Mt. Carroll and well drained and moderately well drained Racine soils in landscape positions similar to those of the Oronoco soil
- The well drained Rockton soils on foot slopes or toe slopes of knolls

*Similar soils:*

- Soils that have a surface layer of loam, loamy fine sand, or silt loam
- Well drained soils that contain more silt throughout
- Soils that have a thicker dark surface layer



### ***Use and Management***

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Returning crop residue to the soil conserves moisture and helps to maintain tilth.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* 5A

## **501B—NewGlarus silt loam, 3 to 6 percent slopes**

### ***Composition***

NewGlarus soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 8 acres

### ***Typical Profile***

0 to 7 inches—very dark grayish brown silt loam  
 7 to 13 inches—dark brown silt loam  
 13 to 28 inches—dark yellowish brown silt loam and silty clay loam  
 28 to 39 inches—yellowish brown clay  
 39 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately slow in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Limestone rock outcrop or channers or flagstones on the surface in places

### ***Inclusions***

#### *Contrasting inclusions:*

- The well drained Gale and Seaton soils in landscape positions similar to those of the NewGlarus soil
- The well drained Dunbarton soils in downslope areas

#### *Similar soils:*

- Well drained soils in which the layer of clayey residuum is 6 inches or less
- Well drained soils that are underlain by sandstone

### ***Use and Management***

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* 3D

## **501C—NewGlarus silt loam, 6 to 12 percent slopes**

### ***Composition***

NewGlarus soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular or long and narrow

*Size of areas:* 3 to 8 acres

### ***Typical Profile***

0 to 8 inches—very dark grayish brown silt loam  
 8 to 23 inches—dark yellowish brown silt loam  
 23 to 33 inches—yellowish brown clay  
 33 to 37 inches—strong brown cherty clay  
 37 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately slow in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or moderately low



*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in strongly convex areas; cobbles and limestone channers or flagstones on the surface in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Gale and Seaton soils in landscape positions similar to those of the NewGlarus soil
- The well drained Dunbarton soils in downslope areas

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Well drained soils in which the layer of clayey residuum is 6 inches or less
- Well drained soils that are underlain by loamy glacial till

### ***Use and Management***

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* 3D

## **501D—NewGlarus silt loam, 12 to 20 percent slopes**

### ***Composition***

NewGlarus soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 8 acres

### ***Typical Profile***

0 to 8 inches—dark grayish brown silt loam

8 to 12 inches—dark brown silt loam

12 to 26 inches—yellowish brown silt loam

26 to 36 inches—reddish brown clay

36 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately slow in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in strongly convex areas; cobbles and limestone channers or flagstones on the surface in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Gale and Seaton soils in landscape positions similar to those of the NewGlarus soil
- The well drained Dunbarton soils near areas of rock outcrop

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Well drained soils in which the layer of clayey residuum is 6 inches or less
- Well drained soils in which the underlying subsoil is sandier

### ***Use and Management***

*Cropland:*

- Conservation tillage systems and applications of manure increase or maintain the organic matter content, improve tilth, and reduce the hazard of erosion.
- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Grazing when the soil is wet results in compaction of the surface layer and poor tilth.

*Woodland:*

- The use of equipment is limited because of the slope.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* 3R

## **501E—NewGlarus silt loam, rocky, 12 to 30 percent slopes**

### ***Composition***

NewGlarus soil and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

### ***Setting***

*Landform and position on the landform:* Plane or convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 3 inches—very dark brown silt loam

3 to 9 inches—brown silt loam

9 to 24 inches—brown and yellowish brown silt loam

24 to 34 inches—strong brown clay

34 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately slow in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in strongly convex areas; cobbles and limestone channers or flagstones on the surface in places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained and moderately well drained Eitzen soils in drainageways

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Well drained soils in which the layer of clayey residuum is 6 inches or less
- Soils that are underlain mainly by fragmental colluvium derived from hard bedrock

### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Fieldwork may be limited by the rocks on the surface.

*Woodland:*

- The use of equipment is limited because of the slope.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* VIe

*Woodland ordination symbol:* 3R

## **522—Boots muck**

### ***Composition***

Boots soil and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent

### ***Setting***

*Landform and position on the landform:* Plane or slightly concave areas on flood plains, terraces, and uplands

*Slope range:* 0 to 1 percent

*Shape of areas:* Irregular

*Size of areas:* 10 to 40 acres

### ***Typical Profile***

0 to 8 inches—very dark brown muck

8 to 60 inches—very dark brown mucky peat

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Very poorly drained

*Permeability:* Moderately rapid or moderate

*Available water capacity:* Very high

*Organic matter content:* Very high

*Surface runoff:* Very slow or ponded

*Depth to water table:* 1 foot above to 1 foot below the surface

*Distinctive properties:* Ponding in areas of localized flooding or where runoff accumulates

### ***Inclusions***

*Contrasting inclusions:*

- Newalbin soils along some narrow flood plains
- Very poorly drained, calcareous spoils from large dredged areas near Lake Winona

*Similar soils:*

- Very poorly drained soils that have as much as 24 inches of very dark gray material below the layer of muck

### ***Use and Management***

*Pasture and forage:*

- Only pasture plants that can tolerate wetness should be selected for planting.

- Restricted use during wet periods helps to prevent compaction and improves tilth.

*Woodland:*

- The seedling mortality rate is high because of the seasonal wetness. Planting only trees that tolerate seasonal wetness reduces the seedling mortality rate.
- The wetness limits reforestation and the use of equipment.
- Trees are subject to windthrow when the soil is excessively wet and winds are strong.

### ***Interpretive Groups***

*Land capability classification:* VIW

*Woodland ordination symbol:* 3W

## **576—Newalbin silt loam**

### ***Composition***

Newalbin soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 1 percent

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 15 acres

### ***Typical Profile***

0 to 7 inches—very dark grayish brown silt loam

7 to 28 inches—very fine sandy loam and silt loam with strata of loamy very fine sand

28 to 60 inches—very dark gray silt loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Slow

*Depth to water table:* 1 to 3 feet

*Frequency of flooding:* Occasional

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg and Minneiska soils on streambanks and natural levees
- Ponded areas in depressions

*Similar soils:*

- Poorly drained soils that have a buried layer of muck at a depth of 30 to 60 inches

### ***Use and Management***

*Cropland:*

- Seasonal flooding limits crop production.

*Pasture and forage:*

- Only pasture plants that can tolerate the flooding and the seasonal wetness should be selected for planting.

### ***Interpretive Groups***

*Land capability classification:* IIW

*Woodland ordination symbol:* Not assigned

## **577—Newalbin silt loam, channeled**

### ***Composition***

Newalbin soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 40 acres

### ***Typical Profile***

0 to 7 inches—very dark grayish brown silt loam

7 to 26 inches—dark gray, mottled silt loam

26 to 34 inches—black, mottled silt loam

34 to 39 inches—very dark gray, mottled silt loam

39 to 44 inches—dark gray silt loam

44 to 60 inches—black silty clay loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Slow

*Depth to water table:* 1 to 3 feet

*Frequency of flooding:* Occasional

*Distinctive properties:* Scour channels throughout the unit

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg and Minneiska soils on natural levees above terraces
- Very poorly drained, cobbly soils above streambeds

*Similar soils:*

- Soils that have a surface layer of fine sandy loam
- Poorly drained soils underlain by muck at a depth of 30 to 60 inches



**Use and Management***Pasture and forage:*

- Only pasture plants that can tolerate the flooding and the seasonal wetness should be selected for planting.

**Interpretive Groups**

*Land capability classification:* Vw

*Woodland ordination symbol:* Not assigned

**578—Newalbin silt loam, very wet****Composition**

Newalbin soil and similar soils: 97 to 99 percent

Contrasting inclusions: 1 to 3 percent

**Setting**

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 1 percent

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 40 acres

**Typical Profile**

0 to 10 inches—very dark gray, mottled silt loam

10 to 24 inches—very dark gray, mottled silt loam

24 to 30 inches—dark gray, mottled silt loam

30 to 44 inches—black silty clay loam

44 to 60 inches—very dark gray and gray silty clay loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Very poorly drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Pondered

*Depth to water table:* 1 foot above to 2 feet below the surface

*Frequency of flooding:* Occasional

**Inclusions***Contrasting inclusions:*

- Very poorly drained organic soils in depressions

*Similar soils:*

- Soils that have a surface layer of muck or sandy loam

**Use and Management***Pasture and forage:*

- Only pasture plants that can tolerate the flooding and the seasonal wetness should be selected for planting.

**Interpretive Groups**

*Land capability classification:* VIIw

*Woodland ordination symbol:* Not assigned

**580B—Blackhammer-Southridge silt loams, 2 to 6 percent slopes****Composition**

Blackhammer soil and similar soils: 55 to 60 percent

Southridge soil and similar soils: 30 to 35 percent

Contrasting inclusions: 5 to 15 percent

**Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 15 acres

**Typical Profile****Blackhammer**

0 to 8 inches—dark grayish brown silt loam

8 to 22 inches—dark yellowish brown silt loam

22 to 60 inches—stratified strong brown and reddish brown clay loam to sandy loam

**Southridge**

0 to 8 inches—dark grayish brown silt loam

8 to 28 inches—dark yellowish brown silt loam

28 to 36 inches—yellowish red cherty clay

36 to 60 inches—red cherty clay

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Blackhammer—moderate; Southridge—moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Blackhammer—moderately low or moderate; Southridge—moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

**Inclusions***Contrasting inclusions:*

- Very poorly drained soils in depressions

*Similar soils:*

- Soils that have limestone or sandstone bedrock at a depth of 60 inches or less
- Moderately well drained or somewhat poorly drained, deep, silty soils in drainageways

**Use and Management***Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to



maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* Blackhammer—4A;  
Southridge—6A

## **580C—Blackhammer-Southridge silt loams, 6 to 12 percent slopes**

### ***Composition***

Blackhammer soil and similar soils: 65 to 70 percent

Southridge soil and similar soils: 20 to 25 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Convex areas  
on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 15 acres

### ***Typical Profile***

#### **Blackhammer**

0 to 9 inches—dark grayish brown silt loam

9 to 26 inches—dark yellowish brown and yellowish  
brown silt loam

26 to 60 inches—stratified strong brown and yellowish  
red gravelly clay loam to sandy loam

#### **Southridge**

0 to 9 inches—very dark grayish brown silt loam

9 to 14 inches—dark brown silt loam

14 to 29 inches—dark yellowish brown silt loam

29 to 60 inches—yellowish red clay

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Blackhammer—moderate; Southridge—  
moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Blackhammer—moderately low  
or moderate; Southridge—moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in  
places

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Nodine and Rollingstone soils on convex side slopes

- The moderately well drained Chaseburg soils that have slopes of less than 6 percent; in narrow drainageways

*Similar soils:*

- Well drained soils that do not have residuum in the subsoil and have limestone or sandstone bedrock at a depth of 3 to 5 feet

### ***Use and Management***

*Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* Blackhammer—4A;  
Southridge—6A

## **580D—Blackhammer-Southridge silt loams, 12 to 20 percent slopes**

### ***Composition***

Blackhammer soil and similar soils: 65 to 70 percent

Southridge soil and similar soils: 20 to 25 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Convex areas  
on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 15 acres

### ***Typical Profile***

#### **Blackhammer**

0 to 8 inches—dark grayish brown silt loam

8 to 25 inches—dark brown and dark yellowish brown  
silt loam

25 to 60 inches—stratified strong brown and yellowish  
red gravelly clay loam and gravelly loam

#### **Southridge**

0 to 8 inches—dark grayish brown silt loam

8 to 25 inches—yellowish brown silt loam

25 to 35 inches—stratified yellowish brown clay loam,  
sandy loam, and loamy sand

35 to 60 inches—red and yellowish red clay

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Blackhammer—moderate; Southridge—moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Blackhammer—moderately low or moderate; Southridge—moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places

### **Inclusions**

*Contrasting inclusions:*

- The well drained Nodine and Rollingstone soils on the steeper convex side slopes
- The moderately well drained Chaseburg soils in narrow drainageways

*Similar soils:*

- Well drained soils that do not have residuum in the subsoil and have limestone or sandstone bedrock at a depth of 3 to 5 feet

### **Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- The use of equipment is limited because of the slope.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IVE

*Woodland ordination symbol:* Blackhammer—4R;  
Southridge—6R

## **584F—Lamoille-Dorerton silt loams, 30 to 45 percent slopes**

### **Composition**

Lamoille soil and similar soils: 40 to 50 percent

Dorerton soil and similar soils: 40 to 45 percent

Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Lamoille—plane or convex areas, Dorerton—convex areas; on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 40 acres

### **Typical Profile**

#### **Lamoille**

0 to 3 inches—very dark grayish brown silt loam

3 to 12 inches—brown silt loam

12 to 15 inches—dark brown silty clay loam

15 to 28 inches—reddish brown cobbly clay

28 to 42 inches—dark brown very cobbly clay

42 to 60 inches—strong brown and dark brown extremely cobbly clay

#### **Dorerton**

0 to 4 inches—very dark gray silt loam

4 to 8 inches—dark brown silt loam

8 to 12 inches—dark brown clay loam

12 to 24 inches—yellowish brown very cobbly loam

24 to 60 inches—yellowish brown extremely cobbly loam

### **Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Lamoille—moderate to slow in the upper part, moderately slow to moderately rapid in the lower part; Dorerton—moderate in the upper part, moderately rapid in the lower part

*Available water capacity:* Lamoille—moderate; Dorerton—low

*Organic matter content:* Lamoille—moderately low or moderate; Dorerton—moderately low

*Surface runoff:* Very rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways in places

### **Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils on the bottom of narrow ravines
- The excessively drained Brodale and well drained Lacrescent soils in the steeper areas

*Similar soils:*

- Well drained soils in areas where the mantle of loess is thicker
- Dolomite limestone or limestone outcrop on nose slopes

### ***Use and Management***

#### *Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

#### *Woodland:*

- The use of equipment is limited because of the slope.
- Removing undesirable species improves the growth of preferred trees.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- The hazard of erosion can be reduced by limiting surface disturbance.

### ***Interpretive Groups***

*Land capability classification:* VIIe

*Woodland ordination symbol:* Lamoille—3R; Dorerton—4R

## **586C—Nodine-Rollingstone silt loams, 4 to 12 percent slopes**

### ***Composition***

Nodine soil and similar soils: 55 to 70 percent

Rollingstone soil and similar soils: 25 to 35 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 10 to 25 acres

### ***Typical Profile***

#### **Nodine**

0 to 7 inches—dark grayish brown silt loam

7 to 15 inches—yellowish brown silt loam

15 to 60 inches—stratified yellowish red and strong brown sandy clay, sandy clay loam, sandy loam, and loamy sand

#### **Rollingstone**

0 to 7 inches—dark grayish brown silt loam

7 to 15 inches—yellowish brown silt loam

15 to 30 inches—yellowish red clay

30 to 41 inches—strong brown sand clay and clay with strata of sandy clay loam

41 to 60 inches—yellowish red sandy clay and clay

### ***Soil Properties and Qualities***

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Nodine—moderate; Rollingstone—moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderately low and moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in some places; stones, cobbles, and chert fragments on the surface in other places

### ***Inclusions***

#### *Contrasting inclusions:*

- The well drained Seaton soils in plane or slightly concave areas

#### *Similar soils:*

- Silty soils that are underlain by limestone or sandstone bedrock at a depth of 30 to 60 inches

### ***Use and Management***

#### *Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Proper site preparation helps to control competing vegetation.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* Nodine—4A; Rollingstone—4C

## **586D—Nodine-Rollingstone silt loams, 12 to 20 percent slopes**

### ***Composition***

Nodine soil and similar soils: 55 to 75 percent

Rollingstone soil and similar soils: 25 to 35 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

#### **Nodine**

0 to 6 inches—dark grayish brown silt loam  
 6 to 16 inches—dark brown and dark yellowish brown silt loam  
 16 to 60 inches—stratified yellowish red and strong brown sandy clay loam, sandy loam, and loamy sand

#### **Rollingstone**

0 to 7 inches—dark grayish brown and dark brown silt loam  
 7 to 11 inches—dark brown silt loam  
 11 to 53 inches—yellowish red clay with few strata of sandy clay loam  
 53 to 60 inches—dark yellowish brown clay loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Nodine—moderate; Rollingstone—moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderately low and moderate

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Sandstone and limestone rock outcrop in some areas; subsoil exposed by erosion in a few places

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg soils in narrow drainageways
- The well drained Seaton soils on plane or concave side slopes

*Similar soils:*

- Soils that have a clayey surface layer
- Soils that are underlain by limestone or sandstone bedrock at a depth of 20 to 60 inches

### ***Use and Management***

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Grazing when the soil is wet results in compaction of the surface layer and poor tilth.

*Woodland:*

- The hazard of erosion can be reduced by limiting surface disturbance.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.

- Proper site preparation helps to control competing vegetation.
- The use of equipment is limited because of the slope.

### ***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* Nodine—4R;  
 Rollingstone—4R

## **587B—Palsgrove silt loam, 2 to 6 percent slopes**

### ***Composition***

Palsgrove soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Plane or slightly convex areas on uplands

*Shape of areas:* Elongated

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 7 inches—very dark grayish brown silt loam  
 7 to 11 inches—dark brown silt loam  
 11 to 37 inches—dark yellowish brown and yellowish brown silt loam  
 37 to 52 inches—yellowish red cherty clay  
 52 inches—hard dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Bedrock outcrop on the outer edges of areas

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Dunbarton soils in some strongly convex areas

*Similar soils:*

- Soils that are underlain by limestone bedrock at a depth of 20 to 40 inches
- Soils that are underlain by sandstone bedrock

### ***Use and Management***

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.



- Returning crop residue to the soil helps to maintain tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* 4A

## **587C—Palsgrove silt loam, 6 to 12 percent slopes**

### **Composition**

Palsgrove soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### **Typical Profile**

0 to 9 inches—dark grayish brown silt loam  
 9 to 21 inches—dark yellowish brown silt loam  
 21 to 41 inches—yellowish brown silt loam  
 41 to 52 inches—dark brown clay  
 52 inches—hard dolomite limestone

### **Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways at irregular intervals; rock outcrop in the lower areas

### **Inclusions**

*Contrasting inclusions:*

- The well drained Dunbarton soils near areas of rock outcrop

*Similar soils:*

- Soils that have a surface layer of silty clay loam

## **Use and Management**

### *Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### *Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4A

## **587D—Palsgrove silt loam, 12 to 20 percent slopes**

### **Composition**

Palsgrove soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 8 acres

### **Typical Profile**

0 to 9 inches—dark grayish brown silt loam  
 9 to 14 inches—dark brown and dark yellowish brown silt loam  
 14 to 40 inches—yellowish brown silty clay loam  
 40 to 48 inches—dark brown and strong brown clay  
 48 inches—hard dolomite limestone

### **Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* High

*Organic matter content:* Moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Rock outcrop in places; dissected landscape

### ***Inclusions***

#### *Contrasting inclusions:*

- The moderately well drained Chaseburg soils in narrow drainageways
- The well drained Dunbarton soils near areas of rock outcrop
- The well drained Gale soils in areas of sandstone rock outcrop
- The well drained Seaton soils in areas of thick loess

#### *Similar soils:*

- Soils that have a surface layer of silty clay loam
- Soils that are underlain by bedrock at a depth of 20 to 40 inches

### ***Use and Management***

#### *Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.

#### *Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

#### *Woodland:*

- The use of equipment is limited because of the dissected landscape.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Planting vigorous nursery stock and increasing the planting rate reduce seedling mortality.

### ***Interpretive Groups***

*Land capability classification:* IVe

*Woodland ordination symbol:* 4R

## **592E—Lamoille-Elbaville silt loams, 20 to 30 percent slopes**

### ***Composition***

Lamoille soil and similar soils: 55 to 60 percent

Elbaville soil and similar soils: 20 to 30 percent

Contrasting inclusions: 10 to 20 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 15 acres

### ***Typical Profile***

#### **Lamoille**

0 to 2 inches—very dark grayish brown silt loam

2 to 7 inches—dark brown silt loam

7 to 15 inches—dark brown silty clay loam

15 to 28 inches—reddish brown cobbly clay loam

28 to 44 inches—strong brown cobbly clay

44 to 60 inches—dark brown extremely cobbly clay loam

#### **Elbaville**

0 to 4 inches—very dark grayish brown silt loam

4 to 9 inches—dark grayish brown silt loam

9 to 22 inches—dark brown and dark yellowish brown silt loam

22 to 36 inches—dark brown and dark reddish brown clay and cobbly clay

36 to 60 inches—dark brown cobbly clay

### ***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Lamoille—moderate to slow in the upper part, moderately slow to moderately rapid in the lower part; Elbaville—moderately slow or moderate in the upper part, moderately rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Lamoille—moderately low or moderate; Elbaville—moderately low

*Surface runoff:* Moderately rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected at irregular intervals by gullies and drainageways 2 to 5 feet deep; hard dolomite limestone rock outcrop in places

### ***Inclusions***

#### *Contrasting inclusions:*

- The well drained and moderately well drained Chaseburg soils in drainageways
- The well drained Dunbarton soils near areas of rock outcrop

#### *Similar soils:*

- Well drained soils that have a loamy or clayey subsoil and substratum
- Well drained soils that have a thick dark surface layer; in concave areas near the base of slopes

### ***Use and Management***

#### *Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

#### *Woodland:*

- The use of equipment is limited because of the dissected landscape.
- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Planting vigorous nursery stock and increasing the

planting rate reduce seedling mortality.

- The hazard of erosion can be reduced by limiting surface disturbance.

### ***Interpretive Groups***

*Land capability classification:* Lamoille—Vle; Elbaville—VIIe

*Woodland ordination symbol:* Lamoille—3R; Elbaville—4R

## **598B—Beavercreek silt loam, 1 to 8 percent slopes, stony**

### ***Composition***

Beavercreek soil and similar soils: 85 to 90 percent

Contrasting inclusions: 10 to 15 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Shape of areas:* Irregular

*Size of areas:* 3 to 15 acres

### ***Typical Profile***

0 to 8 inches—very dark grayish brown silt loam

8 to 60 inches—very dark grayish brown, stratified extremely cobbly fine sand to extremely cobbly loam

### ***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderately rapid

*Available water capacity:* Low

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Frequency of flooding:* Frequent

*Distinctive properties:* Channer- and cobble-sized stones of limestone origin commonly covering 1 to 15 percent of the surface; some areas near stream channels covered with as much as 80 percent stones

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg and well drained Huntsville soils along the outer edges of depressions
- Poorly drained and very poorly drained soils in depressions

*Similar soils:*

- Soils that have a surface layer of sandy loam or loam

### ***Use and Management***

*Pasture and forage:*

- Only pasture plants that can tolerate the flooding and the seasonal wetness should be selected for planting.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Planting only trees that tolerate seasonal wetness reduces the seedling mortality rate.
- The use of equipment is limited because of the flooding.

### ***Interpretive Groups***

*Land capability classification:* VIs

*Woodland ordination symbol:* 3F

## **599E—Norden silt loam, 15 to 30 percent slopes**

### ***Composition***

Norden soil and similar soils: 85 to 98 percent

Contrasting inclusions: 2 to 15 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Elongated and irregular

*Size of areas:* 3 to 8 acres

### ***Typical Profile***

0 to 6 inches—dark grayish brown silt loam

6 to 15 inches—dark yellowish brown silt loam

15 to 27 inches—light olive brown clay loam

27 to 42 inches—stratified olive yellow and olive loam and clay loam

42 to 60 inches—stratified dark olive and light olive brown very fine sandy loam

### ***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* Moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places

### ***Inclusions***

*Contrasting inclusions:*

- The moderately well drained Chaseburg soils near drainageways



- The well drained Frankville and Seaton soils on summits

*Similar soils:*

- Soils that have a surface layer of fine sandy loam or loam
- Soils in which the mantle of loess is 20 or more inches thick

### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the dissected landscape.
- Planting vigorous nursery stock and increasing the planting rate reduce seedling mortality.
- The hazard of erosion can be reduced by limiting surface disturbance.

### ***Interpretive Groups***

*Land capability classification:* VIe

*Woodland ordination symbol:* 4R

## **599F—Norden silt loam, 30 to 45 percent slopes**

### ***Composition***

Norden soil and similar soils: 96 to 98 percent  
Contrasting inclusions: 2 to 4 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 8 acres

### ***Typical Profile***

0 to 6 inches—dark grayish brown silt loam  
6 to 15 inches—dark yellowish brown silt loam  
15 to 29 inches—light olive brown flaggy loam  
29 to 60 inches—greenish gray sandstone

### ***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Available water capacity:* Low

*Organic matter content:* Moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways and gullies at irregular intervals

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Lacrescent soils on very steep side slopes
- The well drained Seaton soils on the lower, concave foot slopes

*Similar soils:*

- Soils that have a surface layer of fine sandy loam or loam

### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the dissected landscape.
- Planting vigorous nursery stock and increasing the planting rate reduce seedling mortality.
- The hazard of erosion can be reduced by limiting surface disturbance.

### ***Interpretive Groups***

*Land capability classification:* VIIe

*Woodland ordination symbol:* 4R

## **604—Huntsville-Beavercreek complex, channeled**

### ***Composition***

Huntsville soil and similar soils: 55 to 60 percent  
Beavercreek soil and similar soils: 25 to 35 percent  
Contrasting inclusions: 5 to 20 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* Huntsville—0 to 2 percent; Beavercreek—1 to 2 percent

*Shape of areas:* Narrow

*Size of areas:* 5 to 70 acres

### ***Typical Profile***

#### **Huntsville**

0 to 10 inches—black silt loam  
10 to 24 inches—black and very dark brown silt loam  
24 to 46 inches—very dark brown and dark brown silt loam



46 to 60 inches—dark brown silt loam

### **Beavercreek**

0 to 10 inches—very dark brown cobbly fine sandy loam

10 to 60 inches—dark brown and pale brown very cobbly loamy sand, fine sandy loam, very cobbly sandy loam, and very cobbly silt loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Huntsville—moderately well drained;  
Beavercreek—moderately well drained and well drained

*Permeability:* Huntsville—moderate; Beavercreek—moderately rapid

*Available water capacity:* Huntsville—very high;  
Beavercreek—low

*Organic matter content:* Huntsville—moderate;  
Beavercreek—moderately low

*Surface runoff:* Medium

*Depth to water table:* Huntsville—4 to 6 feet;  
Beavercreek—more than 6 feet

*Frequency of flooding:* Occasional

*Distinctive properties:* Beavercreek—as much as 80 percent of the surface covered by cobbles and channers in areas near channels

### **Inclusions**

*Contrasting inclusions:*

- The poorly drained and very poorly drained Newalbin soils in the lower areas

*Similar soils:*

- Soils that have about 20 inches of recently deposited silty and loamy sediment and are underlain by colluvium

### **Use and Management**

*Pasture and forage:*

- Only pasture plants that can tolerate the flooding and the seasonal wetness should be selected for planting.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the flooding.
- Proper site preparation helps to control competing vegetation.

### **Interpretive Groups**

*Land capability classification:* Huntsville—IIw;  
Beavercreek—VI

*Woodland ordination symbol:* Huntsville—11A;  
Beavercreek—3F

## **606—Shiloh silt loam, ponded**

### **Composition**

Shiloh soil and similar soils: 95 to 99 percent

Contrasting inclusions: 1 to 5 percent

### **Setting**

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 1 percent

*Shape of areas:* Irregular

*Size of areas:* 3 to 100 acres

### **Typical Profile**

0 to 12 inches—very dark gray, mottled silt loam

12 to 24 inches—very dark gray, mottled silty clay loam

24 to 60 inches—very dark gray, mottled silty clay

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Very poorly drained

*Permeability:* Moderate in the upper part, moderately slow in the lower part

*Available water capacity:* High

*Organic matter content:* High

*Surface runoff:* Ponded

*Depth to water table:* 1 foot above to 2 feet below the surface

*Frequency of flooding:* Frequent

*Distinctive properties:* Subject to long periods of ponding during wet years

### **Inclusions**

*Contrasting inclusions:*

- The poorly drained Comfrey soils in the higher positions on the landscape

*Similar soils:*

- Soils that have a surface layer of silty clay loam
- Soils that are poorly drained

### **Use and Management**

- This soil is unsuited to most uses because of the wetness and the flooding.

### **Interpretive Groups**

*Land capability classification:* VIIIw

*Woodland ordination symbol:* Not assigned

## **815F—Elbaville-Seaton silt loams, 30 to 45 percent slopes**

### **Composition**

Elbaville soil and similar soils: 45 to 55 percent

Seaton soil and similar soils: 35 to 40 percent

Contrasting inclusions: 5 to 20 percent

### **Setting**

*Landform and position on the landform:* Plane or concave areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 50 acres

### **Typical Profile**

#### **Elbaville**

0 to 4 inches—very dark grayish brown silt loam

4 to 15 inches—brown silt loam

15 to 26 inches—dark yellowish brown silt loam

26 to 35 inches—dark brown silty clay loam

35 to 60 inches—yellowish brown very cobbly loam

#### **Seaton**

0 to 8 inches—dark grayish brown silt loam

8 to 14 inches—dark brown silt loam

14 to 30 inches—dark yellowish brown silt loam

30 to 48 inches—dark yellowish brown and yellowish brown loam

48 to 60 inches—yellowish brown loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Elbaville—moderately slow or moderate in the upper part, moderately rapid in the lower part; Seaton—moderate

*Available water capacity:* Elbaville—high; Seaton—very high

*Organic matter content:* Elbaville—moderately low; Seaton—moderate or moderately low

*Surface runoff:* Rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Gullies in some areas

### **Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils in drainageways near the upper part of the unit
- The well drained Lacrescent and Norden and excessively drained Brodale soils in the steeper areas

*Similar soils:*

- Moderately well drained soils in similar landscape positions

### **Use and Management**

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

*Woodland:*

- The use of equipment is limited because of the slope.
- The hazard of erosion can be reduced by limiting surface disturbance.

- Proper site preparation helps to control competing vegetation and reduces the seedling mortality rate.

### **Interpretive Groups**

*Land capability classification:* VIIe

*Woodland ordination symbol:* Elbaville—4R; Seaton—5R

## **826B—Gale-Blackhammer silt loams, 2 to 6 percent slopes**

### **Composition**

Gale soil and similar soils: 55 to 65 percent

Blackhammer soil and similar soils: 20 to 30 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### **Typical Profile**

#### **Gale**

0 to 9 inches—dark grayish brown silt loam

9 to 25 inches—dark brown and dark yellowish brown silt loam

25 to 30 inches—yellowish brown loam

30 to 36 inches—brownish yellow sand

36 to 60 inches—brownish yellow, soft sandstone

#### **Blackhammer**

0 to 7 inches—very dark grayish brown silt loam

7 to 27 inches—dark yellowish brown silt loam

27 to 60 inches—stratified strong brown sandy loam and very pale brown loamy sand

### **Soil Properties and Qualities**

*Depth class:* Gale—moderately deep; Blackhammer—very deep

*Drainage class:* Well drained

*Permeability:* Gale—moderate in the upper part, rapid in the lower part; Blackhammer—moderate

*Available water capacity:* Gale—moderate; Blackhammer—high

*Organic matter content:* Moderate or moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

### **Inclusions**

*Contrasting inclusions:*

- The well drained Seaton soils on summits
- The somewhat excessively drained Eleva soils near areas of sandstone rock outcrop

*Similar soils:*

- Soils that have a higher content of sand

### ***Use and Management***

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* Gale—5D; Blackhammer—4A

## **826C—Gale-Blackhammer silt loams, 6 to 12 percent slopes**

### ***Composition***

Gale soil and similar soils: 55 to 65 percent  
Blackhammer soil and similar soils: 20 to 30 percent  
Contrasting inclusions: 5 to 25 percent

### ***Setting***

*Landform and position on the landform:* Convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

#### **Gale**

0 to 8 inches—dark grayish brown silt loam  
8 to 18 inches—dark yellowish brown and yellowish brown silt loam  
18 to 32 inches—yellowish brown silt loam and loam  
32 to 38 inches—yellowish brown fine sand  
38 to 60 inches—yellowish brown, soft sandstone

#### **Blackhammer**

0 to 9 inches—dark grayish brown silt loam  
9 to 26 inches—dark yellowish brown and yellowish brown silt loam  
26 to 60 inches—stratified strong brown and yellowish red gravelly sandy clay loam, sandy loam, and loam

### ***Soil Properties and Qualities***

*Depth class:* Gale—moderately deep; Blackhammer—very deep

*Drainage class:* Well drained

*Permeability:* Gale—moderate in the upper part, rapid in the lower part; Blackhammer—moderate

*Available water capacity:* Gale—moderate; Blackhammer—high

*Organic matter content:* Moderate or moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Subsoil exposed by erosion in places; sandstone rock outcrop in the lower areas; dissected by drainageways at irregular intervals

### ***Inclusions***

#### *Contrasting inclusions:*

- The well drained Seaton soils on side slopes
- The somewhat excessively drained Eleva soils near areas of sandstone

#### *Similar soils:*

- Well drained soils that have more silt
- Soils that are underlain by clayey material

### ***Use and Management***

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

#### *Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

#### *Woodland:*

- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* Gale—5D; Blackhammer—4A

## **829C—Seaton-Gale silt loams, 6 to 12 percent slopes**

### ***Composition***

Seaton soil and similar soils: 55 to 65 percent  
Gale soil and similar soils: 35 to 45 percent

Contrasting inclusions: 0 to 15 percent

### **Setting**

*Landform and position on the landform:* Seaton—plane or convex areas, Gale—convex areas; on uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### **Typical Profile**

#### **Seaton**

0 to 8 inches—dark grayish brown silt loam

8 to 22 inches—dark yellowish brown silt loam

22 to 43 inches—dark yellowish brown and yellowish brown silt loam

43 to 60 inches—yellowish brown silt loam

#### **Gale**

0 to 8 inches—dark grayish brown silt loam

8 to 32 inches—dark yellowish brown and yellowish brown silt loam

32 to 36 inches—yellowish brown loam

36 to 60 inches—yellowish brown, weakly cemented sandstone

### **Soil Properties and Qualities**

*Depth class:* Seaton—very deep; Gale—moderately deep

*Drainage class:* Well drained

*Permeability:* Seaton—moderate; Gale—moderate in the upper part, rapid in the lower part

*Available water capacity:* Seaton—very high; Gale—moderate

*Organic matter content:* Moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Seaton—subsoil exposed by erosion in places; Gale—gravel and cobbles on the surface in places

### **Inclusions**

*Contrasting inclusions:*

- Poorly drained and somewhat poorly drained soils in depressions and in the lower areas

*Similar soils:*

- Somewhat excessively drained soils less than 2 feet deep over sandstone bedrock

### **Use and Management**

*Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Using stands to shelter trees and avoiding excessive thinning reduce the windthrow hazard.
- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* Seaton—4A; Gale—5D

## **830D—Eleva-Seaton complex, 12 to 30 percent slopes**

### **Composition**

Eleva soil and similar soils: 55 to 65 percent

Seaton soil and similar soils: 25 to 30 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Plane or convex areas on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 5 to 20 acres

### **Typical Profile**

#### **Eleva**

0 to 5 inches—grayish brown cobbly silt loam

5 to 9 inches—dark brown cobbly loam

9 to 22 inches—yellowish brown cobbly fine sandy loam

22 to 26 inches—brownish yellow channery loamy sand

26 to 60 inches—brownish yellow, weakly cemented sandstone

#### **Seaton**

0 to 3 inches—very dark brown silt loam

3 to 8 inches—dark grayish brown silt loam

8 to 13 inches—dark brown silt loam

13 to 52 inches—dark yellowish brown and yellowish brown silt loam

52 to 60 inches—yellowish brown silt loam

### **Soil Properties and Qualities**

*Depth class:* Eleva—moderately deep; Seaton—very deep

*Drainage class:* Eleva—somewhat excessively drained; Seaton—well drained

*Permeability:* Eleva—moderate in the upper part, moderately rapid or rapid in the lower part; Seaton—moderate



*Available water capacity:* Eleva—low; Seaton—very high

*Organic matter content:* Eleva—moderately low;

Seaton—moderately low or moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Cobbles, stones, and boulders in much of the unit; dissected by drainageways at irregular intervals

### ***Inclusions***

*Contrasting inclusions:*

- The well drained and moderately well drained Eitzen soils in narrow drainageways
- The well drained Dunbarton and NewGlarus soils in the higher positions on the landscape or on the lower edge of the mapped areas, adjacent to very steep valley walls
- The well drained Gale soils that have a thicker mantle of loess; on escarpments or in steep areas

*Similar soils:*

- Soils that have a surface layer of silt loam

### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- The use of equipment is limited because of the slope.
- Windthrow can be minimized by using harvesting methods that do not leave the remaining trees widely spaced.
- Removing undesirable species improves the growth of preferred trees.
- The hazard of erosion can be reduced by limiting surface disturbance.

### ***Interpretive Groups***

*Land capability classification:* V1e

*Woodland ordination symbol:* Eleva—2R; Seaton—5R

## **831F—Spinks-Boone-Sogn complex, rocky, 15 to 60 percent slopes**

### ***Composition***

Spinks soil and similar soils: 45 to 55 percent

Boone soil and similar soils: 20 to 25 percent

Sogn soil and similar soils: 10 to 15 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Spinks—foot slopes, Boone—middle part of side slopes, Sogn—

upper part of side slopes and shoulder slopes; on uplands

*Slope range:* Spinks—15 to 25 percent; Boone—15 to 60 percent; Sogn—15 to 45 percent

*Shape of areas:* Irregular

*Size of areas:* 10 to 50 acres

### ***Typical Profile***

#### **Spinks**

0 to 3 inches—dark brown loamy fine sand

3 to 28 inches—dark brown loamy fine sand

28 to 43 inches—stratified brown and yellowish brown loamy sand and sand

43 inches—weakly cemented sandstone

#### **Boone**

0 to 7 inches—very dark brown sandy loam

7 to 10 inches—yellowish brown sandy loam

10 to 13 inches—yellowish brown loamy sand

13 to 60 inches—pale brown, soft sandstone

#### **Sogn**

0 to 5 inches—very dark brown flaggy silt loam

5 to 11 inches—very dark grayish brown flaggy silt loam

11 to 20 inches—dark brown very flaggy silty clay loam

20 inches—dolomite limestone

### ***Soil Properties and Qualities***

*Depth class:* Spinks—deep; Boone—moderately deep; Sogn—shallow

*Drainage class:* Spinks—well drained; Boone—excessively drained; Sogn—somewhat excessively drained

*Permeability:* Spinks—rapid in the upper part, moderately rapid in the lower part; Boone—rapid; Sogn—moderate

*Available water capacity:* Spinks—low; Boone and Sogn—very low

*Organic matter content:* Spinks—moderately low; Boone—low; Sogn—moderate

*Surface runoff:* Medium or rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by drainageways at irregular intervals; rock outcrop in many areas; east- or north-facing slopes

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Billett, Eyota, and Lindstrom soils on foot slopes
- Rock outcrop near areas of the Sogn soil and near escarpments

*Similar soils:*

- Somewhat excessively drained soils that are underlain by shaly limestone bedrock

### ***Use and Management***

#### *Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

#### *Woodland:*

- The use of equipment is limited because of the slope.
- The hazard of erosion can be reduced by limiting surface disturbance.
- Seedlings survive and grow well if competing vegetation is removed or controlled.
- Windthrow can be minimized by using harvesting methods that do not leave the remaining trees widely spaced.
- Removing undesirable species improves the growth of preferred trees.

### ***Interpretive Groups***

*Land capability classification:* Spinks—Vle; Boone and Sogn—VIIIs

*Woodland ordination symbol:* Spinks—2R; Boone—2R; Sogn—not assigned

## **832F—Lacrescent-Rock outcrop complex, 30 to 45 percent slopes**

### ***Composition***

Lacrescent soil and similar soils: 70 to 75 percent

Rock outcrop: 15 to 20 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 2 to 10 acres

### ***Typical Profile***

#### **Lacrescent**

0 to 13 inches—very dark gray cobbly silt loam

13 to 20 inches—very dark grayish brown cobbly silt loam

20 to 28 inches—dark brown cobbly silt loam

28 to 60 inches—dark yellowish brown very cobbly silt loam

### ***Soil Properties and Qualities***

#### **Lacrescent**

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately rapid in the upper part, moderately rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderate or high

*Surface runoff:* Very rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways and small gullies at irregular intervals

### ***Inclusions***

#### *Contrasting inclusions:*

- The excessively drained Boone soils near the upper part of the unit
- The moderately well drained Chaseburg soils in narrow drainageways
- The well drained Seaton, NewGlarus, and Lamoille soils on side slopes and foot slopes

#### *Similar soils:*

- Soils that contain fewer cobbles in the surface layer

### ***Use and Management***

#### *Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

#### *Woodland:*

- The slope, stones on the surface, and the dissected landscape limit the use of equipment.
- Proper site preparation helps to control competing vegetation.

### ***Interpretive Groups***

*Land capability classification:* Lacrescent—VIIe

*Woodland ordination symbol:* Lacrescent—3R

## **832G—Lacrescent-Rock outcrop complex, 45 to 70 percent slopes**

### ***Composition***

Lacrescent soil and similar soils: 70 to 75 percent

Rock outcrop: 15 to 20 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Side slopes on uplands

*Shape of areas:* Long and narrow

*Size of areas:* 10 to 50 acres

### ***Typical Profile***

#### **Lacrescent**

0 to 14 inches—black cobbly loam

14 to 34 inches—dark brown extremely cobbly sandy loam

34 to 60 inches—light yellowish brown extremely cobbly sandy loam

### ***Soil Properties and Qualities***

#### **Lacrescent**

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate or moderately rapid in the upper part, moderately rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderate or high

*Surface runoff:* Very rapid

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by narrow drainageways and small gullies at irregular intervals

#### ***Inclusions***

*Contrasting inclusions:*

- The well drained Frontenac, Elbaville, and Seaton soils on the lower foot slopes
- The moderately well drained and well drained Beaver Creek soils in alluvial fans at the base of ridges and in narrow stream valleys

*Similar soils:*

- Soils that contain fewer cobbles in the surface layer

#### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

*Woodland:*

- The slope, stones on the surface, and the dissected landscape limit the use of equipment.
- Proper site preparation helps to control competing vegetation.

#### ***Interpretive Groups***

*Land capability classification:* Lacrescent—VIIe

*Woodland ordination symbol:* Lacrescent—3R

### **839—Urban land-Minneopa complex**

#### ***Composition***

Urban land: 35 to 45 percent

Minneopa soil and similar soils: 55 to 65 percent

#### ***Setting***

*Landform and position on the landform:* Plane areas on terraces; mainly within the city limits of Goodview and Winona

*Shape of areas:* Irregular

*Size of areas:* 40 to 80 acres

*Slope range:* 0 to 2 percent

*Urban land:* Streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is impossible

### ***Typical Profile***

#### **Minneopa**

0 to 16 inches—black sandy loam

16 to 24 inches—very dark brown gravelly sandy loam

24 to 27 inches—dark brown gravelly coarse sand

27 to 60 inches—gravelly coarse sand

### ***Soil Properties and Qualities***

#### **Minneopa**

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderately rapid in the upper part, rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* High

*Surface runoff:* Slow

*Depth to water table:* 3 to 5 feet

*Frequency of flooding:* Rare

#### ***Inclusions***

*Similar soils:*

- Sandy soils that are somewhat poorly drained

#### ***Use and Management***

- This map unit is used for urban development.

#### ***Interpretive Groups***

*Land capability classification:* Not assigned

*Woodland ordination symbol:* Not assigned

### **840—Urban land-Finchford complex**

#### ***Composition***

Urban land: 35 to 40 percent

Finchford soil and similar soils: 60 to 65 percent

#### ***Setting***

*Landform and position on the landform:* Plane areas on terraces

*Shape of areas:* Irregular

*Size of areas:* 5 to 80 acres

*Slope range:* 0 to 2 percent

*Urban land:* Streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is impossible

### ***Typical Profile***

#### **Finchford**

0 to 8 inches—black sandy loam

8 to 20 inches—black loamy sand

20 to 26 inches—very dark brown loamy sand

26 to 33 inches—very dark grayish brown loamy sand

33 to 37 inches—very dark brown gravelly sand

37 to 60 inches—brown gravelly coarse sand



### ***Soil Properties and Qualities***

#### **Finchford**

*Depth class:* Very deep  
*Drainage class:* Excessively drained  
*Permeability:* Very rapid  
*Available water capacity:* Very low  
*Organic matter content:* Moderately low or moderate  
*Surface runoff:* Slow  
*Depth to water table:* More than 6 feet

#### ***Inclusions***

*Similar soils:*

- Moderately well drained soils that have a water table at a depth of 3 to 5 feet

#### ***Use and Management***

- This map unit is used for urban development.

#### ***Interpretive Groups***

*Land capability classification:* Not assigned  
*Woodland ordination symbol:* Not assigned

### **898F—Bellechester-Brodale complex, rocky, 15 to 60 percent slopes**

#### ***Composition***

Bellechester soil and similar soils: 50 to 55 percent  
 Brodale soil and similar soils: 25 to 35 percent  
 Contrasting inclusions: 10 to 25 percent

#### ***Setting***

*Landform and position on the landform:* Plane or concave side slopes on uplands  
*Shape of areas:* Irregular  
*Size of areas:* 10 to 50 acres  
*Slope range:* Bellechester—15 to 50 percent; Brodale—15 to 60 percent

#### ***Typical Profile***

##### **Bellechester**

0 to 4 inches—very dark brown loamy fine sand  
 4 to 22 inches—very dark grayish brown loamy sand  
 22 to 38 inches—dark brown loamy fine sand  
 38 to 48 inches—yellowish brown loamy fine sand  
 48 to 54 inches—white, light brownish gray, and brown fine sand  
 54 to 60 inches—white and pale brown, soft sandstone

##### **Brodale**

0 to 10 inches—very dark brown flaggy loam  
 10 to 34 inches—brown and yellowish brown flaggy loam  
 34 inches—pale brown sandstone

### ***Soil Properties and Qualities***

*Depth class:* Bellechester—deep; Brodale—very deep  
*Drainage class:* Excessively drained  
*Permeability:* Bellechester—rapid; Brodale—moderate in the upper part, moderate or moderately rapid in the lower part  
*Available water capacity:* Bellechester—low; Brodale—very low  
*Organic matter content:* Bellechester—moderate; Brodale—moderate or high  
*Surface runoff:* Rapid or very rapid  
*Depth to water table:* More than 6 feet  
*Distinctive properties:* Sandstone or dolomite limestone rock outcrop in 1 to 10 percent of the unit

#### ***Inclusions***

*Contrasting inclusions:*

- The well drained Eyota and Lindstrom soils on the lower foot slopes
- Rock outcrop in the upper part of the unit

*Similar soils:*

- Excessively drained soils that are underlain by bedrock at a depth of 20 to 40 inches

#### ***Use and Management***

*Pasture and forage:*

- Adjusting stocking rates helps to maintain the quality and quantity of forage, especially on the steeper slopes.

#### ***Interpretive Groups***

*Land capability classification:* VIIIs  
*Woodland ordination symbol:* Not assigned

### **1002—Fluvaquents, channeled**

This unit consists of nearly level, moderately well drained to poorly drained soils. These soils vary in texture and thickness. They are in areas that are dissected by stream channels. They are frequently flooded.

No interpretive groups are assigned.

### **1010—Riverwash**

This unit consists of nearly level, poorly drained, very rapidly permeable sediments along the channels of rivers. It is mostly on narrow sandbars that typically are 1 to 3 feet above the water level. The sandbars shift as the river channel alters its course. Areas are elongated and range from 3 to 8 acres in size. They are frequently flooded.

No interpretive groups are assigned.



**1013—Pits, quarries**

This unit consists of quarries, adjacent stockpiles of unusable stone, and small areas of exposed bedrock. Because the materials are highly variable, no soil interpretations have been made for these areas.

No interpretive groups are assigned.

**1015—Psamments, fill**

This unit is in areas of cut and fill used for roads, building sites, recreational areas, and similar kinds of development. In fill or disposal areas, the characteristics of the soil material are more varied. These areas typically consist of the subsoil and underlying material from nearby soils. Most areas consist of very poorly drained soils in depressions or on flood plains. In areas where the soil material has been removed, the remaining material is similar to the subsoil and underlying material of adjacent soils. Slopes range from 0 to 12 percent. Most areas are irregular in shape and range from 3 to about 15 acres in size.

No interpretive groups are assigned.

**1016—Udorthents, loamy**

These soils are nearly level to sloping. They have been altered by excavation or cutting and filling with loamy material. In most areas cutting and filling have been used for site improvement. Individual areas of these soils are irregular in shape and range from 4 to 40 acres in size.

These soils are in cut and fill areas along highways, filled-in dumps or landfills, leveled gravel pits, and filled-in sites of poorly drained or very poorly drained soils. Most of the filled-in material is loamy.

No interpretive groups are assigned.

**1029—Pits, gravel**

This map unit consists of open excavations from which gravel is being removed or has been removed and areas of filled land. The size, shape, and depth of the pits are influenced by the quality and quantity of gravel. The surface layer and existing vegetation have been stripped, and the sand and gravel have been removed. The pits range from 3 to about 40 acres in size. Pits smaller than 3 acres are noted on the map with a special symbol.

No interpretive groups are assigned.

**1822B—Abscota Variant sand, 1 to 6 percent slopes*****Composition***

Abscota Variant soil and similar soils: 90 to 98 percent  
Contrasting inclusions: 2 to 10 percent

***Setting***

*Landform and position on the landform:* Plane areas on flood plains

*Shape of areas:* Elongated or fan shaped

*Size of areas:* 2 to 10 acres

***Typical Profile***

0 to 16 inches—light yellowish brown sand

16 to 41 inches—light yellowish brown fine sand

41 to 56 inches—very dark grayish brown fine sand

56 to 60 inches—dark brown fine sand

***Soil Properties and Qualities***

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Rapid

*Available water capacity:* Low

*Organic matter content:* Low

*Surface runoff:* Slow

*Depth to water table:* 3 to 6 feet

*Frequency of flooding:* Occasional

***Inclusions***

*Contrasting inclusions:*

- Poorly drained soils in some depressions

*Similar soils:*

- Soils that have a surface layer of cobbly sand or flaggy sand
- Well drained and moderately well drained, sandy soils that have buried silty or loamy alluvium at a depth of more than 20 inches

***Use and Management***

*Cropland:*

- The best suited crops are those that can withstand drought.
- Seasonal flooding limits crop production.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

***Interpretive Groups***

*Land capability classification:* IIIs

*Woodland ordination symbol:* Not assigned

**1830—Eitzen silt loam****Composition**

Eitzen soil and similar soils: 95 to 98 percent  
 Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane areas on flood plains  
*Slope range:* 1 to 2 percent  
*Shape of areas:* Long and narrow  
*Size of areas:* 5 to 20 acres

**Typical Profile**

0 to 10 inches—very dark brown silt loam  
 10 to 28 inches—stratified very dark brown, very dark grayish brown, and dark grayish brown silt loam  
 28 to 47 inches—very dark brown silt loam  
 47 to 60 inches—dark yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Well drained and moderately well drained  
*Permeability:* Moderate  
*Available water capacity:* Very high  
*Organic matter content:* Moderate  
*Surface runoff:* Medium  
*Depth to water table:* More than 6 feet  
*Frequency of flooding:* Occasional

**Inclusions**

*Contrasting inclusions:*  
 • The well drained Port Byron and Mt. Carroll soils along the outer edge of the unit  
*Similar soils:*  
 • Soils that have more than 40 inches of recently deposited sediment

**Use and Management**

*Cropland:*  
 • Seasonal flooding limits crop production and hinders harvesting activities.  
*Pasture and forage:*  
 • Restricted use during wet periods helps to prevent compaction and improves tilth.  
 • Proper stocking rates and rotation grazing help to keep the pasture in good condition.

**Interpretive Groups**

*Land capability classification:* IIw  
*Woodland ordination symbol:* Not assigned

**1857—Eitzen silt loam, channeled****Composition**

Eitzen soil and similar soils: 90 to 95 percent  
 Contrasting inclusions: 5 to 10 percent

**Setting**

*Landform and position on the landform:* Plane areas on flood plains  
*Slope range:* 1 to 2 percent  
*Shape of areas:* Long and narrow  
*Size of areas:* 5 to 20 acres

**Typical Profile**

0 to 8 inches—black silt loam  
 8 to 28 inches—stratified black and very dark brown silt loam  
 28 to 47 inches—very dark brown silt loam  
 47 to 60 inches—dark yellowish brown silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Well drained and moderately well drained  
*Permeability:* Moderate  
*Available water capacity:* Very high  
*Organic matter content:* Moderate  
*Surface runoff:* Medium  
*Depth to water table:* More than 6 feet  
*Frequency of flooding:* Occasional  
*Distinctive properties:* Dissected by gully and scour channels

**Inclusions**

*Contrasting inclusions:*  
 • The somewhat poorly drained Littleton soils on benches that adjoin drainageways  
 • The well drained Lacrescent soils along the walls of narrow ravines  
*Similar soils:*  
 • Soils that have a surface layer of loam or fine sandy loam  
 • Somewhat poorly drained, silty soils in areas where streams originate

**Use and Management**

*Pasture and forage:*  
 • Restricted use during wet periods helps to prevent compaction and improves tilth.  
 • Proper stocking rates and rotation grazing help to keep the pasture in good condition.

**Interpretive Groups**

*Land capability classification:* Vw  
*Woodland ordination symbol:* Not assigned

**1860—Comfrey silt loam, channeled****Composition**

Comfrey soil and similar soils: 90 to 98 percent

Contrasting inclusions: 2 to 10 percent

**Setting**

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 10 to 200 acres

**Typical Profile**

0 to 12 inches—very dark gray and black, mottled silt loam

12 to 20 inches—very dark gray, mottled silty clay loam

20 to 60 inches—very dark gray, mottled loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Available water capacity:* High

*Organic matter content:* High or very high

*Surface runoff:* Slow

*Depth to water table:* 0 to 3 feet

*Frequency of flooding:* Frequent

*Distinctive properties:* Open water in places

**Inclusions**

*Contrasting inclusions:*

- Riverwash
- Very poorly drained soils in depressions

*Similar soils:*

- Soils that have a surface layer of loam or silty clay loam
- Soils that have loamy sand or coarser sand below a depth of 40 inches

**Use and Management**

*Pasture and forage:*

- Restricted use during wet periods helps to prevent compaction and improves tilth.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

**Interpretive Groups**

*Land capability classification:* Vw

*Woodland ordination symbol:* Not assigned

**1861—Chaseburg silt loam, channeled****Composition**

Chaseburg soil and similar soils: 85 to 98 percent

Contrasting inclusions: 2 to 15 percent

**Setting**

*Landform and position on the landform:* Plane areas on flood plains

*Slope range:* 0 to 2 percent

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 20 acres

**Typical Profile**

0 to 7 inches—dark grayish brown silt loam

7 to 60 inches—dark grayish brown silt loam with strata of grayish brown fine sandy loam

**Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Available water capacity:* Very high

*Organic matter content:* Moderate

*Surface runoff:* Slow

*Depth to water table:* 3 to 6 feet

*Frequency of flooding:* Occasional

*Distinctive properties:* Stream channels 1 to 10 feet deep and scour channels 1 to 2 feet deep in places

**Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils along the upper reaches

*Similar soils:*

- Soils that have a surface layer of fine sandy loam
- Soils that have less than 40 inches of recently deposited sediment and are underlain by a buried silty soil or by cobbly and flaggy material

**Use and Management**

*Pasture and forage:*

- Restricted use during wet periods helps to prevent compaction and improves tilth.
- Proper stocking rates and rotation grazing help to keep the pasture in good condition.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

**Interpretive Groups**

*Land capability classification:* Vw

*Woodland ordination symbol:* 4A

**1893B—Beaver Creek Variant loam, 1 to 6 percent slopes****Composition**

Beaver Creek soil and similar soils: 80 to 90 percent

Contrasting inclusions: 10 to 20 percent



### **Setting**

*Landform and position on the landform:* Plane areas on flood plains

*Shape of areas:* Long and narrow

*Size of areas:* 3 to 5 acres

### **Typical Profile**

0 to 6 inches—very dark brown loam

6 to 10 inches—very dark grayish brown sandy loam

10 to 19 inches—very dark brown very fine sandy loam

19 to 26 inches—black loam

26 to 32 inches—very dark brown gravelly loam

32 to 38 inches—dark brown very cobbly loam

38 to 60 inches—dark brown and brown extremely cobbly loam

### **Soil Properties and Qualities**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate in the upper part, moderately rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate or high

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Frequency of flooding:* Occasional

*Distinctive properties:* Dissected by large, intermittent stream channels

### **Inclusions**

*Contrasting inclusions:*

- The well drained and moderately well drained Beaver Creek soils in the upper reaches of drainageways
- The moderately well drained Chaseburg soils in the lower positions on the landscape

*Similar soils:*

- Soils that have a surface layer of sandy loam

### **Use and Management**

*Cropland:*

- Seasonal flooding limits crop production.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.

### **Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* 4A

## **1936—Hoopeston sandy loam, bedrock substratum**

### **Composition**

Hoopeston soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### **Setting**

*Landform and position on the landform:* Plane or slightly concave areas on terraces and uplands

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 2 to 20 acres

### **Typical Profile**

0 to 6 inches—very dark grayish brown sandy loam

6 to 13 inches—very dark brown sandy loam

13 to 23 inches—dark grayish brown, mottled sandy loam

23 to 30 inches—grayish brown, mottled sandy loam

30 to 33 inches—brownish yellow and light brownish gray loamy sand

33 to 40 inches—light brownish gray, mottled fine sand

40 to 45 inches—stratified yellowish brown and

brownish yellow clay loam and sandy clay loam

45 to 60 inches—white, fine grained, soft sandstone

### **Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderately rapid or rapid in the upper part, moderately slow or moderate in the lower part

*Available water capacity:* Low

*Organic matter content:* High

*Surface runoff:* Slow

*Depth to water table:* 1 to 3 feet

### **Inclusions**

*Contrasting inclusions:*

- The somewhat poorly drained Lawler soils in landscape positions similar to those of the Hoopeston soil

*Similar soils:*

- Soils that have a surface layer of loam

### **Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of



manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

**Interpretive Groups**

*Land capability classification:* IIe

*Woodland ordination symbol:* Not assigned

**1937—Lawler loam, bedrock substratum**

**Composition**

Lawler soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane or slightly concave areas on terraces and uplands

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular

*Size of areas:* 2 to 20 acres

**Typical Profile**

0 to 8 inches—black loam

8 to 12 inches—very dark brown loam

12 to 16 inches—dark brown and dark grayish brown, mottled loam

16 to 25 inches—dark yellowish brown, mottled loam

25 to 35 inches—light brownish gray, mottled loam

35 to 41 inches—light gray sand

41 to 52 inches—white fine sand

52 to 60 inches—white, fine grained sandstone

**Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate in the upper part, very rapid in the lower part

*Available water capacity:* Moderate

*Organic matter content:* High

*Surface runoff:* Slow

*Depth to water table:* 2 to 4 feet

*Distinctive properties:* Few sinkholes scattered throughout

**Inclusions**

*Contrasting inclusions:*

- The poorly drained Marshan soils in depressions
- The poorly drained Hoopston soils in plane areas

*Similar soils:*

- Soils that have a surface layer of silt loam

**Use and Management**

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

**Interpretive Groups**

*Land capability classification:* IIs

*Woodland ordination symbol:* Not assigned

**1951A—Flagler sandy loam, bedrock substratum, 0 to 2 percent slopes**

**Composition**

Flagler soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane areas on terraces and uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 20 acres

**Typical Profile**

0 to 8 inches—very dark brown sandy loam

8 to 14 inches—very dark grayish brown sandy loam

14 to 28 inches—dark brown sandy loam

28 to 33 inches—yellowish brown loamy sand

33 to 40 inches—brownish yellow loamy fine sand

40 to 49 inches—stratified yellowish brown and dark brown loamy sand and sandy loam

49 to 51 inches—dark brown loam

51 inches—dolomite limestone

**Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Somewhat excessively drained

*Permeability:* Moderately rapid to very rapid in the upper part, moderately rapid to moderately slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Sinkholes in some areas

**Inclusions***Contrasting inclusions:*

- The well drained Spinks soils in narrow valleys

*Similar soils:*

- Soils that have a surface layer of loamy sand or loam

**Use and Management***Cropland:*

- Tillage practices that leave crop residue on the surface conserve moisture and help to control soil blowing.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

**Interpretive Groups**

*Land capability classification:* IIIs

*Woodland ordination symbol:* Not assigned

**1951B—Flagler sandy loam, bedrock substratum, 2 to 6 percent slopes****Composition**

Flagler soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Convex areas on terraces and uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 20 acres

**Typical Profile**

- 0 to 8 inches—very dark brown sandy loam
- 8 to 11 inches—dark grayish brown sandy loam
- 11 to 34 inches—dark brown and yellowish brown sandy loam
- 34 to 52 inches—stratified, yellowish brown loamy sand and clay
- 52 inches—dolomite limestone

**Soil Properties and Qualities**

*Depth class:* Deep

*Drainage class:* Somewhat excessively drained

*Permeability:* Moderately rapid to very rapid in the upper part, moderately rapid to moderately slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

**Inclusions***Contrasting inclusions:*

- The well drained Spinks soils near areas of sandstone rock outcrop

*Similar soils:*

- Soils that have a surface layer of loam or loamy sand

**Use and Management***Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

**Interpretive Groups**

*Land capability classification:* IIIe

*Woodland ordination symbol:* Not assigned

**1952B—Keltner silt loam, 3 to 6 percent slopes****Composition**

Keltner soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

**Setting**

*Landform and position on the landform:* Plane or concave areas on side slopes in the uplands

*Shape of areas:* Elongated and irregular

*Size of areas:* 5 to 15 acres

**Typical Profile**

- 0 to 7 inches—black silt loam
- 7 to 13 inches—very dark brown silt loam
- 13 to 28 inches—dark brown silt loam
- 28 to 35 inches—dark yellowish brown, mottled silty clay loam
- 35 to 51 inches—light olive brown, mottled silty clay loam
- 51 to 60 inches—olive yellow shale that crushes to clay

**Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* 3 to 5 feet

*Distinctive properties:* Sinkholes in some areas

### ***Inclusions***

*Contrasting inclusions:*

- Haverhill soils in seep spots near areas of shale outcrop on convex slopes

*Similar soils:*

- Soils that have a thinner and very dark grayish brown surface layer; in wooded or previously wooded areas
- Soils that have a thinner or thicker mantle of loess

### ***Use and Management***

*Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### ***Interpretive Groups***

*Land capability classification:* IIe

*Woodland ordination symbol:* Not assigned

## **1952C—Keltner silt loam, 6 to 12 percent slopes**

### ***Composition***

Keltner soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Plane or slightly concave areas on side slopes in the uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 15 acres

### ***Typical Profile***

- 0 to 16 inches—black silt loam
- 16 to 20 inches—very dark brown silt loam
- 20 to 27 inches—dark brown silt loam
- 27 to 35 inches—dark brown silty clay loam
- 35 to 41 inches—light olive brown and olive yellow clay
- 41 to 47 inches—pale olive, mottled clay

47 to 60 inches—olive yellow shale that crushes to clay

### ***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate in the upper part, slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* 3 to 5 feet

*Distinctive properties:* Sinkholes in some areas

### ***Inclusions***

*Contrasting inclusions:*

- The somewhat poorly drained Haverhill soils in seep spots in areas of shale outcrop

*Similar soils:*

- Soils that have a thinner and very dark grayish brown surface layer; in wooded or previously wooded areas
- Soils that have a mantle of loess that is less than 30 or more than 50 inches thick

### ***Use and Management***

*Cropland:*

- Minimum tillage, contour farming, terraces, and strip cropping reduce the hazard of erosion.
- Conservation tillage systems and applications of manure increase or maintain the organic matter content and improve tilth.

*Pasture and forage:*

- Proper stocking rates and rotation grazing help to keep the pasture in good condition.
- Controlling weeds and applying fertilizer help to maintain the quality and quantity of forage.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* Not assigned

## **1953—Marshan silt loam, loamy substratum**

### ***Composition***

Marshan soil and similar soils: 90 to 95 percent

Contrasting inclusions: 5 to 10 percent

### ***Setting***

*Landform and position on the landform:* Plane or concave areas on terraces and uplands

*Slope range:* 0 to 2 percent

*Shape of areas:* Irregular and elongated

*Size of areas:* 3 to 15 acres

### ***Typical Profile***

- 0 to 8 inches—black, mottled silt loam

8 to 17 inches—very dark gray, mottled silt loam  
 17 to 27 inches—gray, mottled silt loam  
 27 to 36 inches—gray, mottled loam  
 36 to 56 inches—stratified, gray, mottled sand and loamy sand  
 56 to 60 inches—stratified light greenish gray and light gray, mottled clay to sand

### **Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Poorly drained  
*Permeability:* Moderate in the upper part, rapid in the lower part  
*Available water capacity:* High  
*Organic matter content:* High or moderate  
*Surface runoff:* Slow  
*Depth to water table:* 1.0 to 2.5 feet

### **Inclusions**

*Contrasting inclusions:*  
 • The somewhat poorly drained Lawler soils in elevated areas  
*Similar soils:*  
 • Soils that have a surface layer of loam, clay loam, or silty clay loam  
 • Soils that have a thicker surface layer  
 • Soils that have sandy material at a depth of more than 40 inches but do not have loamy material above that depth  
 • Soils that are underlain by bedrock as shallow as 60 inches

### **Use and Management**

*Cropland:*  
 • Most of the climatically adapted crops can be grown if adequate drainage and protection from flooding are provided.  
 • Seasonal wetness limits crop production.

*Pasture and forage:*  
 • Selecting plants that tolerate wetness or providing drainage improves yields.  
 • Restricted use during wet periods helps to prevent compaction and improves tilth.

### **Interpretive Groups**

*Land capability classification:* 1lw  
*Woodland ordination symbol:* Not assigned

## **1954B—Spinks loamy fine sand, bedrock substratum, 1 to 6 percent slopes**

### **Composition**

Spinks soil and similar soils: 90 to 95 percent  
 Contrasting inclusions: 5 to 10 percent

### **Setting**

*Landform and position on the landform:* Plane, convex, or concave areas in the uplands  
*Shape of areas:* Irregular  
*Size of areas:* 5 to 80 acres

### **Typical Profile**

0 to 9 inches—very dark grayish brown loamy fine sand  
 9 to 18 inches—dark brown loamy fine sand  
 18 to 30 inches—yellowish brown loamy fine sand  
 30 to 54 inches—light yellowish brown fine sand  
 54 to 60 inches—soft, white sandstone

### **Soil Properties and Qualities**

*Depth class:* Deep  
*Drainage class:* Well drained  
*Permeability:* Rapid in the upper part, moderately rapid in the lower part  
*Available water capacity:* Low  
*Organic matter content:* Moderately low  
*Surface runoff:* Medium  
*Depth to water table:* More than 6 feet  
*Distinctive properties:* Sinkholes in some areas

### **Inclusions**

*Contrasting inclusions:*  
 • Poorly drained soils in depressions  
*Similar soils:*  
 • Soils that have a surface layer of sandy loam or sand  
 • Well drained soils that have strata of sandy loam or loam in the lower part of the subsoil  
 • Soils that are underlain by clay  
 • Somewhat poorly drained, sandy soils in drainageways

### **Use and Management**

*Cropland:*  
 • Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.  
 • The best suited crops are those that can withstand drought.  
 • Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

*Pasture and forage:*  
 • Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

*Woodland:*  
 • Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.  
 • The use of wheeled and tracked equipment is limited because the soil is loose when dry.  
 • Reforestation is severely limited because of the droughtiness.



### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* 2S

## **1954C—Spinks loamy fine sand, bedrock substratum, 6 to 15 percent slopes**

### ***Composition***

Spinks soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### ***Setting***

*Landform and position on the landform:* Plane, convex, or concave areas in the uplands

*Shape of areas:* Irregular

*Size of areas:* 3 to 10 acres

### ***Typical Profile***

0 to 3 inches—very dark brown loamy fine sand

3 to 7 inches—dark brown loamy fine sand

7 to 51 inches—dark yellowish brown and yellowish brown fine sandy loam

51 to 55 inches—brown fine sand

55 to 60 inches—pale brown, fine grained sandstone

### ***Soil Properties and Qualities***

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Rapid in the upper part, moderately rapid in the lower part

*Available water capacity:* Low

*Organic matter content:* Moderately low

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Dissected by few gullies at irregular intervals

### ***Inclusions***

*Contrasting inclusions:*

- The well drained Billett soils in shallow drainageways
- The well drained Mt. Carroll soils in landscape positions similar to those of the Spinks soil

*Similar soils:*

- Soils that have a surface layer of fine sand
- Sandy soils that are underlain by sandstone bedrock at a depth of 20 to 40 inches

### ***Use and Management***

*Cropland:*

- Minimum tillage, contour farming, terraces, and stripcropping reduce the hazard of erosion.
- Grassed waterways help to prevent the formation of gullies. Grassed waterways can be established by shaping and seeding natural drainageways.

- The best suited crops are those that can withstand drought.

- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

*Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

*Woodland:*

- Competing vegetation can be controlled by tillage, girdling, or careful spraying with herbicides.
- The use of wheeled and tracked equipment is limited because the soil is loose when dry.
- Reforestation is severely limited because of the droughtiness.

### ***Interpretive Groups***

*Land capability classification:* IIIe

*Woodland ordination symbol:* 2S

## **1955A—Waukee loam, bedrock substratum, 0 to 2 percent slopes**

### ***Composition***

Waukee soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### ***Setting***

*Landform and position on the landform:* Plane areas on terraces and uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 20 acres

### ***Typical Profile***

0 to 12 inches—black loam

12 to 17 inches—dark brown loam

17 to 24 inches—dark brown and dark yellowish brown loam

24 to 34 inches—yellowish brown gravelly sandy loam

34 to 42 inches—yellowish brown gravelly loamy sand

42 to 48 inches—brownish yellow clay loam

48 to 60 inches—weathered bedrock

### ***Soil Properties and Qualities***

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, very rapid to moderately slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Scattered scour channels on the surface

### **Inclusions**

#### *Contrasting inclusions:*

- The somewhat excessively drained Flagler soils in landscape positions similar to those of the Waukee soil
- The somewhat poorly drained Lawler soils in the lower positions on the landscape

#### *Similar soils:*

- Soils that have a surface layer of silt loam or sandy loam
- Well drained soils that are underlain by sand at a depth of more than 40 inches
- Well drained soils that are underlain by soft sandstone bedrock

### **Use and Management**

#### *Cropland:*

- The best suited crops are those that can withstand drought.
- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

#### *Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

### **Interpretive Groups**

*Land capability classification:* IIc

*Woodland ordination symbol:* Not assigned

## **1955B—Waukee loam, bedrock substratum, 2 to 6 percent slopes**

### **Composition**

Waukee soil and similar soils: 85 to 95 percent

Contrasting inclusions: 5 to 15 percent

### **Setting**

*Landform and position on the landform:* Plane areas on terraces and uplands

*Shape of areas:* Irregular

*Size of areas:* 5 to 20 acres

### **Typical Profile**

- 0 to 12 inches—black loam
- 12 to 17 inches—dark brown loam
- 17 to 24 inches—dark brown and dark yellowish brown loam
- 24 to 34 inches—yellowish brown gravelly sandy loam
- 34 to 42 inches—yellowish brown gravelly loamy sand
- 42 to 48 inches—brownish yellow clay loam
- 48 to 60 inches—weathered bedrock

### **Soil Properties and Qualities**

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part, very rapid to moderately slow in the lower part

*Available water capacity:* Moderate

*Organic matter content:* Moderate

*Surface runoff:* Medium

*Depth to water table:* More than 6 feet

*Distinctive properties:* Scour channels in some areas

### **Inclusions**

#### *Contrasting inclusions:*

- The somewhat excessively drained Flagler soils in landscape positions similar to those of the Waukee soil
- The somewhat poorly drained Lawler soils in the lower positions on the landscape

#### *Similar soils:*

- Soils that have a surface layer of silt loam
- Well drained soils that have a thicker surface layer
- Well drained soils that are underlain by soft sandstone bedrock

### **Use and Management**

#### *Cropland:*

- Minimum tillage and contour farming reduce the hazard of erosion.
- The best suited crops are those that can withstand drought.
- Selecting plants that tolerate droughtiness or applying irrigation water improves yields.

#### *Pasture and forage:*

- Selecting plants that tolerate droughtiness and harvesting at the proper stage of growth increase yields and improve the quality of forage.

### **Interpretive Groups**

*Land capability classification:* IIc

*Woodland ordination symbol:* Not assigned

## **1960B—Haverhill Variant clay loam, 1 to 8 percent slopes**

### **Composition**

Haverhill soil and similar soils: 95 to 98 percent

Contrasting inclusions: 2 to 5 percent

### **Setting**

*Landform and position on the landform:* Plane or convex areas on uplands

*Shape of areas:* Irregular

*Size of areas:* 2 to 15 acres

**Typical Profile**

0 to 8 inches—very dark gray, mottled clay loam  
 8 to 13 inches—olive gray, mottled clay  
 13 to 18 inches—pale olive, mottled clay  
 18 to 30 inches—stratified pale olive clay and light olive brown gravelly clay loam  
 30 to 60 inches—olive gray clay

**Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Poorly drained  
*Permeability:* Moderate in the upper part, slow in the lower part  
*Available water capacity:* Low  
*Organic matter content:* Moderate  
*Surface runoff:* Medium  
*Depth to water table:* 1 to 2 feet  
*Distinctive properties:* A few seep areas in places

**Inclusions**

*Contrasting inclusions:*  
 • The well drained Racine soils in summitlike areas  
*Similar soils:*  
 • Soils that have a surface layer of silty clay loam or loam

**Use and Management**

*Cropland:*  
 • Most of the climatically adapted crops can be grown if adequate drainage and protection from flooding are provided.  
 • Seasonal wetness limits crop production.  
*Pasture and forage:*  
 • Restricted use during wet periods helps to prevent compaction and improves tilth.  
 • Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.

**Interpretive Groups**

*Land capability classification:* IVw  
*Woodland ordination symbol:* Not assigned

**1990—Otter mucky silt loam, very wet****Composition**

Otter soil and similar soils: 95 to 98 percent  
 Contrasting inclusions: 2 to 5 percent

**Setting**

*Landform and position on the landform:* Plane areas on flood plains  
*Slope range:* 0 to 1 percent  
*Shape of areas:* Long and narrow  
*Size of areas:* 3 to 8 acres

**Typical Profile**

0 to 16 inches—mucky silt loam  
 16 to 24 inches—black, mottled silty clay loam  
 24 to 30 inches—very dark gray and dark gray, mottled silty clay loam  
 30 to 60 inches—gray, mottled silt loam

**Soil Properties and Qualities**

*Depth class:* Very deep  
*Drainage class:* Very poorly drained  
*Permeability:* Moderate  
*Available water capacity:* High  
*Organic matter content:* Very high or high  
*Surface runoff:* Slow or ponded  
*Depth to water table:* 0 to 2 feet  
*Frequency of flooding:* Rare  
*Distinctive properties:* Numerous seeps and free-flowing springs throughout the unit

**Inclusions**

*Contrasting inclusions:*  
 • The moderately well drained Chaseburg soils in swales  
*Similar soils:*  
 • Soils that have a surface layer of silt loam  
 • Very poorly drained soils that have as much as 3 feet of silty overwash  
 • Very poorly drained soils that have as much as 2 feet of muck

**Use and Management**

*Pasture and forage:*  
 • Restricted use during wet periods helps to prevent compaction and improves tilth.  
 • Grazing when the soil is wet results in compaction of the surface layer, poor tilth, and excessive runoff.

**Interpretive Groups**

*Land capability classification:* VIw  
*Woodland ordination symbol:* Not assigned

**Prime Farmland**

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food,

feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 120,310 acres in the survey area, or about 30 percent of the total acreage, meets the soil

requirements for prime farmland. Scattered areas of this land are throughout the county. Most of this prime farmland is used for crops, mainly corn and hay.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify as prime farmland only in areas where this limitation has been overcome by drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.



# Use and Management of the Soils

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This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock or wetness can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

## Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly

grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1982, about 56 percent of the county, or about 232,000 acres, was used for crops (7). Corn and alfalfa accounted for about 80 percent of the cultivated crops. A small acreage of soybeans, which are grown mainly in the southwestern part of the county, and small grain were also grown. About 11 percent of the county, or about 45,000 acres, is currently used for pasture. The acreage used for crops and pasture is gradually decreasing as urban development expands at the rate of about 0.5 percent per year. In 1982, about 15,500 acres, or about 4 percent of the county, was urban or built-up land.

The potential of the soils in Winona County for increased production of food is good. Most areas that are suitable for crops and pasture are presently used for these purposes, but production could generally be increased by applying the latest crop production technology to all of the cropland in the county. This soil survey can greatly facilitate the application of such technology.

The main concern in managing the soils in Winona County for crops and pasture is controlling soil blowing and water erosion. Soil blowing is a concern on most of the soils in the county that are suited to crops. It occurs mostly in the fall or early spring, when the soils are bare of vegetation. Soil blowing removes valuable organic matter and nutrients and tends to increase droughtiness. It can damage or destroy plants in a few hours if winds are strong and the soils are dry and have no protective cover. Soil blowing can be controlled on sandy soils, such as Boone, Flagler, and Spinks soils, by growing row crops in narrow alternating strips with

sod-forming crops, using conservation tillage practices that leave most of the crop residue on the surface throughout the year, and keeping the surface as rough as possible.

Water erosion is also a concern in areas used for crops. Most of the soils suitable for cultivation are on ridges that have long, gently sloping to moderately steep slopes. These soils erode easily because they have a high content of silt, which can be easily dislodged by the impact of raindrops and can be easily transported by runoff.

Water erosion is damaging for two reasons. First, the productivity of the soil is reduced as plant nutrients, organic matter, and the surface layer are lost and part of the subsoil is incorporated into the plow layer. Second, water erosion on farmland results in the sedimentation of rivers and streams. Control of water erosion minimizes this pollution and improves the quality of water for recreational uses and for fish and wildlife.

The effects of erosion are especially damaging on soils that have a thin productive layer, such as Dunbarton and Rollingstone soils. Over time, the loss of the productive mantle of silt results in a cultivated layer of firm clay that is difficult to till.

Extensive erosion occurred in the county during the period from about 1860 to 1940. Ridgetops and valley slopes were cleared. Wheat and corn were grown in square fields. The corn was planted up and down the slope, and the fields were commonly cross cultivated. Horse-drawn equipment was used for cultivation, and some fields were cultivated as many as eight or nine times in a season (8).

The excessive tillage and the oxidation of organic matter reduced the size of clusters of soil particles. As a result, raindrops more easily broke down the clusters into finer particles. The water filled pores and voids within the surface soil, which resulted in a puddled soil that crusted as it dried. As runoff and erosion increased, individual particles of soil were washed away and were deposited on the floor of stream valleys (6). The sediment, mostly silty material, was 2 to 4 feet thick. Cobbles and gravel washed out of gullies on the steep, wooded valley slopes. As a result, coarse sediment now covers the more productive soil along the floor of the upper reaches of valleys.

Gully and sheet erosion are the two main types of erosion in Winona County. Gully erosion, the most common process, is the same process that, over a much longer period of time, carved the deep valleys. Gullies were common throughout the county in the past. In some areas they were so deep that they could no longer be crossed by mechanized equipment. These areas were abandoned as cropland. Since the late

1930's, however, soil conservation practices have been applied in the area and soil loss has been significantly reduced. Most of the gullies in cultivated areas have been filled, shaped, and seeded to form grassed waterways (fig. 6). Small dams have been constructed at the head of steep gullies to reduce the hazard of erosion in the lower areas of pasture and woodland.

In many cropped fields and some pastures, much of the original surface layer remains even though deep gullies may be a few feet away. The sheet erosion process is most intense on the most convex parts of the steeper slopes. These convex surfaces have lost all or part of the surface layer through erosion. Generally, cultivated soils in nearly level or gently sloping areas and soils that have not been cultivated have not been affected by erosion.

Most of the farms in the county are livestock farms, which are well suited to soils on which erosion-control measures are needed. Livestock require large amounts of forage and pasture. Pastures of grasses, which provide a dense sod, help to protect the soil from erosion. Forage crops also promote the development of clusters of soil particles, called aggregates, and provide glue-like substances that help the aggregates to resist the impact of rainfall and the cutting action of runoff. These glue-like substances persist for 2 or 3 years. Including grasses and legumes in the cropping system also produces nitrogen for the subsequent crop.

A conservation tillage system keeps a vegetative cover on the soil for extended periods. A system that leaves crop residue on the surface increases the rate of water infiltration and helps to control runoff and erosion. Conservation tillage methods include full-width tillage, chisel-plow or disc or strip tillage, till planting on ridges, and no-till farming.

Contour stripcropping and terraces are suitable on the long, smooth slopes on the ridges and on valley foot slopes. Contour stripcropping includes planting on the contour and alternating strips of corn and forage crops. This practice is common on most of the farms in the county. It is applied mostly on sloping or moderately steep soils, such as Blackhammer and Frankville soils.

Terraces are common on the broad, sloping ridgetops in the central and southwestern parts of the county. The silty Mt. Carroll, Port Byron, and Seaton soils are well suited to terraces because they are deep and friable and have long slopes. Cutting and filling on these soils are not hindered by bedrock or a dense, clayey subsoil.

Grassed waterways are important because of the significant hazard of gully erosion in parts of the county. Shallow drainageways that cross sloping areas can easily develop into gullies unless they are shaped and seeded and a grass cover is maintained.





**Figure 6.—A grassed waterway in an area of Eitzen silt loam, channeled.**

Wetness is a limitation on small, scattered tracts that are suitable for cropland. It either prevents cropping or significantly reduces yields in most years. Along the bottom of streams, successful drainage is dependent upon intercepting below-ground seepage from upslope. Intercepting the seepage usually requires deep trenching and is not always successful. Suitable outlets are difficult to maintain in some places.

In most years, irrigation can greatly increase crop yields on sandy soils, such as Boone, Spinks, and Flagler soils. Since the available water capacity is very low to moderate in these soils, regular additions of water may be needed during dry periods. If these soils are irrigated, they can be used for specialty crops, such as garden crops. Permits for water usage are available from the Department of Natural Resources.

Flooding is the main concern along stream valleys.

Chaseburg and Huntsville soils are examples of soils in these areas. Most flooding occurs early in the spring, and the water recedes in time for planting. In places, the cropland is protected from flooding by roads, dams, and dikes. The effects of flooding are less severe than in the past because the soils are better protected by conservation practices. Also, channels are deeper and are better able to carry runoff because sediment has filled the flood plains and increased the height of the channel banks (6).

Natural soil fertility is fairly high on the deep, silty soils in the county. Most of the soils on ridgetops, valley foot slopes, and silty terraces have a very high level of phosphorus and a low level of potassium. These soils are mostly medium acid or strongly acid. Seaton soils are examples of soils on terraces. Soils that formed mostly in clayey material, such as Rollingstone soils,

are low in phosphorus and have a medium or low level of potassium.

On most soils, corn responds well to applications of fertilizer, particularly nitrogen and potassium. Periodic applications of lime are needed on soils on the ridges, valley slopes, and terraces to raise the pH level sufficiently for good growth of crops, especially alfalfa and other crops that grow well on slightly acid or neutral soils. Lime is generally not needed for legumes on bottom-land soils because these soils are typically neutral or mildly alkaline. Legumes respond well to applications of potassium, which not only increases yields but increases resistance to winterkill.

Organic matter is an important source of nitrogen for plants. Cattle, particularly dairy cattle, provide large amounts of organic matter in the form of manure, which can be applied to cropland. Applications of manure can improve fertility, increase the rate of water infiltration, and reduce surface crusting and the hazard of erosion.

About 11 percent of the county is used for pasture. Soils that are poorly suited to cultivated crops because of the slope, a low available water capacity, or wetness are typically used for pasture. Some areas that are suitable for crops are used for pasture because they are too small or too oddly shaped to farm efficiently.

Kentucky bluegrass is the main pasture species. Many pastures are brushy or weedy. Removing brush and weeds and replacing the bluegrass with more productive plants greatly increase yields.

Birdsfoot trefoil grows well on poorly drained to well drained soils, but it can be difficult to establish. The well drained soils in the county are well suited to brome, orchardgrass, and alfalfa. Once established, the pastures can be maintained and kept productive by applying fertilizer and lime and deferring grazing until the plants have reached the proper height. Clipping mature plants and controlling weeds increase forage yields by increasing the number of productive plants. Maintaining proper stocking rates, managing grazing, and rotating pastures help to maintain the quality and quantity of forage.

Pastures on bottom land are in wet areas or are divided into small tracts by the dissection of meandering streams. Reseeding is difficult in these areas. Management is generally limited to removing brush and trees and controlling livestock numbers. The wet soils, such as Newalbin silt loam, channeled, are well suited to bluegrass. They typically remain productive throughout the summer. In places that are not accessible to mechanized equipment, planting reeds, canarygrass, or Garrison creeping foxtail increases forage (6).

A small acreage in Winona County is used for apple orchards. Most of the orchards are near the village of

La Crescent. The soils best suited to orchards are the Seaton soils on the valley slopes below bluffs that face north and east. Because these sites are slower to warm up in the spring, the trees bloom later and thus the blooms are generally not damaged by late killing frosts. The valleys are better sites than the ridges for orchards. If sites that have good air circulation are selected for orchards, cold air moving down the slopes can move out of the orchards and thus will not form pockets of frost. In many places orchards on the ridges are successful, but wind can interfere with spraying or can cause severe dropping of fruit. Slopes that face south and west warm up rapidly in the spring, and early blossoms on the trees in these areas are susceptible to frost damage. Occasional warm spells in winter can cause injury to trees.

Orchards are typically planted in areas that are too steep for row crops. On slopes of more than 20 percent, the use of spraying equipment can be hazardous. If mechanical equipment is used, however, trees can be managed successfully on slopes as steep as 30 percent (4).

### Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in



the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

### Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (11). Only class and subclass are used in this survey.

*Capability classes*, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

*Capability subclasses* are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The

letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

### Woodland Management and Productivity

David Svien, forester, State Department of Natural Resources, helped prepare this section.

Before Winona County was settled, forest covered much of the land area. Two large tracts of land, one in the southwestern part of the county and the other between Lewiston and St. Charles, were covered with prairie vegetation and brush and supported scattered groves of bur oak. A small tract of prairie was along the Mississippi River, where Winona, Goodview, and Minnesota City now stand. Trees have been cleared in most areas used for cultivated crops. Most of the areas that remain wooded are too steep, too wet, or too small to use for crops. The soils in these areas produce trees of good quality if the woodland is properly managed.

Woodland now makes up about 32 percent of the county. The largest areas of woodland are in associations 6 and 10, described in the section "General Soil Map Units." Oak, shagbark hickory, butternut hickory, quaking aspen, and paper birch are the most common trees on the steep or very steep sides of ridges in association 6. The trees are mostly on slopes bordering the narrow upper reaches of valleys and on north-facing slopes along the wider valleys. Soils on southern exposures, particularly along the wider valleys, support bunch grasses, such as little bluestem, sideoats grama, and other warm-season prairie species.

Small areas of woodland remain on the narrow ends of ridgetops in associations 2 and 3. The most common trees at the time of settlement were white oak, red oak, elm, basswood, maple, wild cherry, and pine. This vegetation covered much of the upland ridges in the

county and was part of the Big Woods of the Upper Midwest.

The main tree species on the bottom land are cottonwood, black ash, yellow birch, hackberry, silver maple, red maple, and willow. Although the largest areas of woodland on bottom land are in association 10, small tracts are also in associations 7, 8, and 9. Much of the woodland on the flood plain in association 10 is accessible only by water. Nearly all of this woodland is part of the natural wildlife refuge system.

Woodland management practices, such as thinning mature trees, removing undesirable species, and controlling livestock grazing, can increase woodland productivity in the county. Protection from fire and control of insects and disease are also needed. Establishing logging roads, skid trails, and livestock paths on steep slopes can cause erosion.

More information about woodland management is available from the Soil Conservation Service, the Cooperative Extension Service, or private foresters.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: *R*, *X*, *W*, *T*, *D*, *C*, *S*, and *F*.

In table 7, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

*Erosion hazard* is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent

of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

*Equipment limitation* reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

*Seedling mortality* refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

*Windthrow hazard* is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe*



indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It generally is the dominant species on the soil and is the one that determines the ordination class.

*Trees to plant* are those that are suitable for commercial wood production.

## Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

## Recreation

Winona County, with its deeply carved landscape of valleys, steep hillsides, and ridgetops, has many areas of scenic, geological, and historical interest. These areas are used for camping, hiking, hunting, fishing, sightseeing, picnicking, and boating. Public lands that are available for recreational uses include areas within the Upper Mississippi Wildlife Refuge, scattered tracts owned by the Minnesota State Department of Natural Resources, and Whitewater State Park.

Recreational development has increased in the county in recent years. Many soils are suited to recreational development, but the soils in associations 3, 6, 7, 8, 9, and 10, described in the section "General Soil Map Units," are the best suited. The soils in associations 3, 6, and 7 are on narrow ridgetops and steep, wooded hillsides. Many streams, some of which support trout, are in these areas.

Association 10 is characterized by numerous marshes, backwater stream channels, and low, narrow tracts of woodland. This association provides opportunities for hunting deer, waterfowl, and small game. Fur trapping is an important activity in the marshes.

A system of snowmobile trails has been constructed in associations 3, 4, 6, 7, and 8. The potential for further development of campgrounds, picnic areas, and trails for hiking, horseback riding, and snowmobiles is good in many areas within these associations. The wooded hillsides and narrow ridges and valleys provide large areas of land for turkey and deer hunting. The marshes along the Mississippi River provide refuge for waterfowl. The Mississippi River provides opportunities for fishing and boating. The sandbars along the channel are attractive picnicking and camping sites. The Whitewater River is suitable for canoeing.

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the

height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

*Camp areas* require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

*Picnic areas* are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

*Playgrounds* require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

*Paths and trails* for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

*Golf fairways* are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They

have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

## Wildlife Habitat

Winona County has a large and varied population of fish and wildlife. White-tailed deer, cottontail rabbits, squirrels, raccoons, ruffed grouse, woodchucks, hawks, and many types of songbirds inhabit the wooded areas. In recent years wild turkeys have been introduced to the county, and their population is increasing. Pheasants and cottontails inhabit the farmed areas, where food and cover are available. Some creeks and streams support brook trout, rainbow trout, and brown trout. Brook trout are confined to the narrower, colder streams. The ponds and marshes along the Mississippi River provide resting and feeding areas for migratory waterfowl in fall and spring. The river supports a wide variety of game fish, including northern pike, walleye, sauger, bass, sunfish, and crappie. Fish of many species are harvested by a small number of commercial fishermen.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates



that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

*Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

*Grasses and legumes* are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, brome grass, clover, and alfalfa.

*Wild herbaceous plants* are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

*Hardwood trees* and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, apple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

*Coniferous plants* furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

*Wetland plants* are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland

plants are smartweed, wild millet, cordgrass, rushes, sedges, and reeds.

*Shallow water areas* have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

*Habitat for openland wildlife* consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include pheasant, meadowlark, field sparrow, cottontail, and red fox.

*Habitat for woodland wildlife* consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

*Habitat for wetland wildlife* consists of open, marshy or swampy shallow water areas (fig. 7). Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

## Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

*Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.*

*The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.*





**Figure 7.—An area of Shiloh silt loam, ponded. This soil is well suited to habitat for wetland wildlife.**

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about

kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology;

locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the "Glossary."

### Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

*Shallow excavations* are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

*Dwellings* and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and

swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

*Local roads and streets* have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

*Lawns and landscaping* require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

### Sanitary Facilities

Table 12 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfill. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the



soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

*Septic tank absorption fields* are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

*Sewage lagoons* are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

*Sanitary landfills* are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

*Daily cover for landfill* is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

### Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard

construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

*Roadfill* is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

*Sand* and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification

are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

*Topsoil* is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

## Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not



favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

*Pond reservoir areas* hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

*Embankments, dikes, and levees* are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

*Drainage* is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that

affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

*Irrigation* is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

*Terraces and diversions* are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

*Grassed waterways* are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.



# Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics (13).

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

## Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

*Depth* to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under the heading "Soil Series and Their Morphology."

*Texture* is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 8). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than

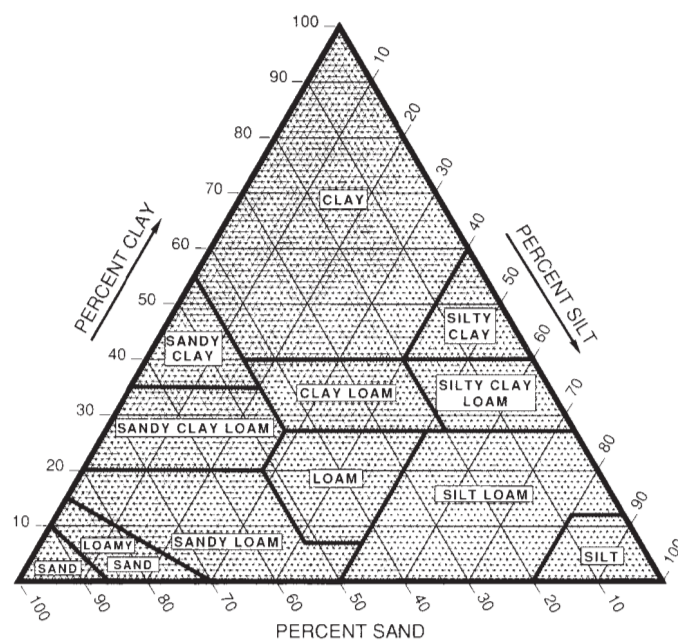


Figure 8.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the "Glossary."

*Classification* of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering

properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

*Rock fragments* larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

*Percentage (of soil particles) passing designated sieves* is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

*Liquid limit and plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

## Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

*Clay* as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter.

In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

*Moist bulk density* is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at  $\frac{1}{3}$  bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

*Permeability* refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

*Available water capacity* refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

*Soil reaction* is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for



fertility and stabilization, and in determining the risk of corrosion.

*Shrink-swell potential* is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

*Erosion factor K* indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

*Erosion factor T* is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

*Wind erodibility groups* are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy

loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

*Organic matter* is the plant and animal residue in the soil at various stages of decomposition. In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

## Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

*Hydrologic soil groups* are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained



sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

*Flooding*, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). *Common* is used when the occasional and frequent classes are grouped for certain purposes. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

*High water table* (seasonal) is the highest level of a saturated zone in the soil in most years. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

*Depth to bedrock* is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

*Subsidence* is the settlement of organic soils or of saturated mineral soils of very low density. Subsidence results from either desiccation and shrinkage or oxidation of organic material, or both, following drainage. Subsidence takes place gradually, usually over a period of several years. Table 17 shows total subsidence, which results from a combination of factors.

*Potential frost action* is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured,

clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

*Risk of corrosion* pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be

needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

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# Classification of the Soils

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The system of soil classification used by the National Cooperative Soil Survey has six categories (13). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

**ORDER.** Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

**SUBORDER.** Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udoll (*Ud*, meaning humid, plus *oll*, from Mollisol).

**GREAT GROUP.** Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludolls (*Hapl*, meaning minimal horizonation, plus *udoll*, the suborder of the Mollisols that has a udic moisture regime).

**SUBGROUP.** Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludolls.

**FAMILY.** Families are established within a subgroup

on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludolls.

**SERIES.** The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

## Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (10). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (12). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

### **Abscota Variant**

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Rapid

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 1 to 6 percent

*Taxonomic class:* Sandy, mixed, mesic Typic Udifluvents

### Typical Pedon

Abscota Variant sand, 1 to 6 percent slopes, 2,100 feet south and 950 feet east of the northwest corner of sec. 14, T. 108 N., R. 10 W.

C1—0 to 16 inches; light yellowish brown (10YR 6/4) sand that has thin strata of yellowish brown (10YR 5/4) sand and a 1-inch stratum of dark grayish brown (10YR 3/2) silt loam; single grain in the sand; weak very thin platy structure in the silt loam; loose in the sand; very friable in the silt loam; neutral; clear smooth boundary.

C2—16 to 35 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; neutral; clear smooth boundary.

C3—35 to 41 inches; light yellowish brown (10YR 6/4) fine sand that has thin strata of dark grayish brown (10YR 4/2) silt loam; single grain in the sand; very friable in the silt loam; neutral; clear smooth boundary.

Ab—41 to 56 inches; very dark grayish brown (10YR 3/2) fine sand; few thin light yellowish brown (10YR 6/4) strata in the upper part; weak fine granular structure; very friable; neutral; clear smooth boundary.

Bwb—56 to 60 inches; dark brown (10YR 4/3) fine sand; single grain; loose; neutral.

### Range in Characteristics

*All horizons:*

Hue—10YR or 2.5Y

Value—3 to 6

Chroma—2 to 4

Texture—sand, loamy sand, fine sand, or loamy fine sand with thin strata of finer textures

### Beavercreek Series

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderately rapid

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 1 to 8 percent

*Taxonomic class:* Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents

### Typical Pedon

Beavercreek silt loam, 1 to 8 percent slopes, stony, 1,825 feet south and 1,425 feet west of the northeast corner of sec. 7, T. 106 N., R. 8 W.

A—0 to 8 inches; stratified very dark grayish brown (10YR 3/2) and dark brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; weak thick platy structure; very friable; neutral; clear smooth boundary.

2C—8 to 60 inches; stratified very dark grayish brown (10YR 3/2) and dark brown (10YR 4/3) extremely cobbly silt loam, extremely cobbly fine sand, extremely cobbly fine sandy loam, extremely cobbly loamy fine sand, and extremely cobbly loam; weak fine subangular blocky structure; very friable; about 15 percent pebbles and 55 percent dolomite cobbles; neutral.

### Range in Characteristics

*Depth to carbonates:* 40 to 80 inches

*Percent of surface covered by stones:* 1 to 3

*A horizon:*

Hue—10YR

Value—3 to 6

Chroma—2 or 3

Texture—silt loam or cobbly fine sandy loam

Content of rock fragments—0 to 20 percent

*2C horizon:*

Hue—10YR to 2.5Y

Value—3 to 6

Chroma—2 to 4

Texture—the very gravelly, very cobbly, extremely gravelly, or extremely cobbly analogs of fine sandy loam, sand, fine sand, loamy fine sand, loamy sand, very fine sandy loam, loam, or silt loam

Content of rock fragments—35 to 70 percent

### Beavercreek Variant

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate in the upper part; moderately rapid in the lower part

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 1 to 6 percent

*Taxonomic class:* Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents

### Typical Pedon

Beavercreek Variant loam, 1 to 6 percent slopes, 1,200

feet south and 825 feet west of the northeast corner of sec. 24, R. 8 W., T. 106 N.

- Ap—0 to 6 inches; very dark brown (10YR 2/2) loam; weak fine granular structure; very friable; neutral; abrupt smooth boundary.
- A1—6 to 10 inches; very dark grayish brown (10YR 3/2) sandy loam; weak very fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.
- A2—10 to 19 inches; very dark brown (10YR 2/2) very fine sandy loam that has thin seams of dark brown (10YR 4/3); weak very fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.
- A3—19 to 26 inches; black (10YR 2/1) loam; weak very fine subangular blocky structure; very friable; about 5 percent limestone pebbles and channers; neutral; clear smooth boundary.
- 2A4—26 to 32 inches; very dark brown (10YR 2/2) gravelly loam; weak very fine subangular blocky structure; very friable; about 15 percent dolomite pebbles and channers; neutral; clear smooth boundary.
- 2AC—32 to 38 inches; dark brown (10YR 3/3) very cobbly loam; weak very fine subangular blocky structure; very friable; about 50 percent pebbles and cobbles; neutral; clear smooth boundary.
- 2C—38 to 60 inches; dark brown (10YR 4/3) and brown (10YR 5/3) extremely cobbly sandy loam; weak very fine subangular blocky structure; very friable; about 70 percent gravel and cobbles; neutral.

#### Range in Characteristics

*Depth to carbonates:* 30 to more than 60 inches

#### Ap horizon:

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—loam  
Content of rock fragments—0 to 15 percent

#### A horizon:

Hue—10YR  
Value—2 or 3  
Chroma—1 to 3  
Texture—sandy loam, very fine sandy loam, loam, or gravelly loam  
Content of rock fragments—0 to 20 percent

#### 2AC horizon:

Colors and textures similar to those of the A and C horizons

#### 2C horizon:

Hue—10YR  
Value—4 or 5

Chroma—3 or 4

Texture—extremely cobbly sandy loam, cobbly fine sandy loam, or very cobbly fine sandy loam

Content of rock fragments—15 to 70 percent

### Becker Series

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderately rapid in the upper part; rapid in the lower part

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Taxonomic class:* Coarse-loamy, mixed, mesic Typic Hapludolls

#### Typical Pedon

Becker fine sandy loam, 275 feet west and 375 feet north of the southeast corner of sec. 6, T. 107 N., R. 10 W.

Ap—0 to 9 inches; black (10YR 2/1) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; very friable; neutral; clear smooth boundary.

A1—9 to 26 inches; black (10YR 2/1) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure; very friable; neutral; gradual smooth boundary.

A2—26 to 30 inches; very dark brown (10YR 2/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine to medium subangular blocky structure; very friable; neutral; clear smooth boundary.

Bw1—30 to 36 inches; dark brown (10YR 4/3) fine sandy loam; weak medium subangular blocky structure; very friable; neutral; clear smooth boundary.

2Bw2—36 to 43 inches; dark brown (10YR 4/3) loamy fine sand that has few masses of very dark grayish brown (10YR 3/2); weak coarse subangular blocky structure; very friable; neutral; clear smooth boundary.

2C—43 to 60 inches; dark brown (10YR 4/3) and brown (10YR 5/3) loamy fine sand; weak coarse subangular blocky structure; very friable; neutral.

#### Range in Characteristics

*Depth to carbonates:* 30 to more than 60 inches

*Thickness of the mollic epipedon:* 24 to 40 inches

*Content of rock fragments:* 0 to 15 percent

#### A horizon:

Hue—10YR  
Value—2 or 3



Chroma—1 or 2  
Texture—fine sandy loam

*B horizon:*

Hue—10YR or 2.5Y  
Value—3 to 5  
Chroma—2 to 4  
Texture—sandy loam, fine sandy loam, loamy fine sand, loamy sand, or loamy coarse sand

*2C horizon:*

Hue—10YR or 2.5Y  
Value—4 or 5  
Chroma—1 to 4  
Texture—coarse sand, sand, fine sand, or loamy fine sand

### ***Bellechester Series***

*Depth class:* Very deep  
*Drainage class:* Excessively drained  
*Permeability:* Rapid  
*Landform:* Uplands  
*Parent material:* Sandy colluvium and residuum  
*Slope range:* 15 to 50 percent  
*Taxonomic class:* Sandy, mixed, mesic Entic Hapludolls

#### **Typical Pedon**

Bellechester loamy fine sand, in an area of Bellechester-Brodale complex, rocky, 15 to 60 percent slopes; 950 feet east and 770 feet north of the southwest corner of sec. 24, T. 106 N., R. 10 W.

Ap—0 to 4 inches; very dark brown (10YR 2/2) loamy fine sand, dark grayish brown (10YR 4/2) dry; weak fine granular structure; very friable; medium acid; abrupt smooth boundary.

A—4 to 22 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; medium acid; clear wavy boundary.

BA—22 to 31 inches; dark brown (10YR 3/3) loamy fine sand; weak fine subangular blocky structure; very friable; medium acid; clear wavy boundary.

Bw1—31 to 38 inches; dark brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; very friable; medium acid; clear wavy boundary.

Bw2—38 to 48 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine subangular blocky structure; very friable; about 2 percent channers of sandstone; medium acid; clear wavy boundary.

C—48 to 54 inches; white (10YR 8/2), light brownish gray (10YR 6/2), and brown (10YR 5/3) fine sand; single grain; loose; medium acid; clear smooth boundary.

2Cr—54 to 60 inches; white (10YR 8/2) and pale brown

(10YR 7/3), weakly cemented, fine grained, soft sandstone; slightly acid.

#### **Range in Characteristics**

*Thickness of the mollic epipedon:* 15 to 24 inches

*Content of rock fragments:* 0 to 15 percent

*Depth to soft bedrock:* 40 to 70 inches

*A horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—loamy fine sand

*BA horizon:*

Colors and textures similar to those of the Bw and A horizons

*Bw horizon:*

Hue—10YR  
Value—4 to 6  
Chroma—3 to 6  
Texture—loamy sand, loamy fine sand, fine sand, or sand

*C horizon:*

Hue—10YR  
Value—5 to 8  
Chroma—2 to 8  
Texture—sand or fine sand

### ***Billett Series***

*Depth class:* Very deep  
*Drainage class:* Well drained  
*Permeability:* Moderately rapid in the upper part; rapid in the lower part  
*Landform:* Terraces and uplands  
*Parent material:* Loamy sediments over sandy sediments  
*Slope range:* 1 to 6 percent  
*Taxonomic class:* Coarse-loamy, mixed, mesic Mollic Hapludalfs

#### **Typical Pedon**

Billett fine sandy loam, 1 to 6 percent slopes, 400 feet east and 200 feet south of the northwest corner of sec. 35, T. 106 N., R. 10 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

E—9 to 14 inches; dark brown (10YR 4/3), very dark grayish brown (10YR 3/2), and brown (10YR 5/3) fine sandy loam; weak medium platy structure; very friable; neutral; clear smooth boundary.

Bt1—14 to 19 inches; dark brown (10YR 4/3) fine sandy

loam; weak medium subangular blocky structure; very friable; dark brown (10YR 3/3) coatings on faces of peds; few faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

Bt2—19 to 26 inches; dark brown (10YR 4/3) fine sandy loam; weak medium prismatic structure parting to fine angular blocky; very friable; dark brown (10YR 3/3) coatings on faces of peds; few faint very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; about 1 percent pebbles 2 to 5 millimeters across; neutral; clear smooth boundary.

BC—26 to 30 inches; very pale brown (10YR 7/4) fine sand; single grain; loose with masses and lamellae of dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) loamy fine sand; weak very fine subangular blocky structure; very friable; few faint dark brown (10YR 4/3) clay bridges between sand grains; slightly acid; clear smooth boundary.

C—30 to 60 inches; very pale brown (10YR 7/4) and brownish yellow (10YR 6/6) fine sand; few thin lamellae of dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) loamy fine sand; very friable to loose in the fine sand; very friable in the loamy fine sand; few faint dark yellowish brown (10YR 4/4) clay bridges between sand grains; neutral.

#### Range in Characteristics

*Content of rock fragments:* 0 to 15 percent

#### *Ap horizon:*

Hue—10YR

Value—3

Chroma—2 or 3

Texture—fine sandy loam

#### *E horizon:*

Hue—10YR

Value—3 to 5

Chroma—2 or 3

Texture—fine sandy loam

#### *Bt horizon:*

Hue—7.5YR or 10YR

Value—4 to 6

Chroma—3 to 6

Texture—fine sandy loam or sandy loam

#### *BC horizon:*

Colors and textures similar to those of the Bt and C horizons

#### *C horizon:*

Hue—10YR or 7.5YR

Value—5 to 7

Chroma—3 to 6

Texture—fine sand, sand, loamy fine sand, or loamy sand

## **Blackhammer Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Loess and the underlying residuum

*Slope range:* 2 to 20 percent

*Taxonomic class:* Fine-silty, mixed, mesic Typic

Hapludalfs

### **Typical Pedon**

Blackhammer silt loam, in an area of Blackhammer-Southridge silt loams, 6 to 12 percent slopes; 2,150 feet south and 475 feet east of the northwest corner of sec. 10, T. 106 N., R. 7 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine and very fine roots; neutral; clear smooth boundary.

Bt1—9 to 18 inches; dark yellowish brown (10YR 4/4) silt loam; dark brown (10YR 4/3) coatings on peds; weak fine subangular blocky structure; friable; common thin clay films on faces of peds; common fine roots; slightly acid; clear smooth boundary.

Bt2—18 to 26 inches; yellowish brown (10YR 5/4) silt loam; dark brown (10YR 4/3) coatings on peds; moderate medium subangular blocky structure; friable; few fine and very fine roots; few thin discontinuous very dark brown (10YR 2/2) clay films on faces of peds; medium acid; abrupt smooth boundary.

2Bt3—26 to 60 inches; stratified strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) gravelly sandy clay to loam; moderate coarse subangular blocky structure in the finer textured part and weak coarse subangular blocky in the coarser textured part; friable in the coarser textured part and firm in the finer textured part; about 18 percent coarse fragments; yellow (10YR 7/6) fine sand coatings on faces of peds; few thin discontinuous clay films on faces of peds in the finer textured part and in pores; 20 percent gravel; strongly acid.

### **Range in Characteristics**

#### *Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

Content of rock fragments—0 to 5 percent

#### *E horizon:*

Present in some pedons

*Bt horizon:*

Hue—10YR  
 Value—4 or 5  
 Chroma—3 or 4  
 Texture—silt loam or silty clay loam  
 Content of rock fragments—0 to 5 percent

*2Bt horizon:*

Hue—2.5YR to 10YR  
 Value—4 to 6  
 Chroma—4 to 6  
 Texture—stratified sandy clay to loam or the  
     gravelly analogs of the textures within that  
     range  
 Content of rock fragments—5 to 25 percent

**Boone Series**

*Depth class:* Moderately deep  
*Drainage class:* Excessively drained  
*Permeability:* Rapid  
*Landform:* Uplands  
*Parent material:* Sandy residuum  
*Slope range:* 2 to 60 percent  
*Taxonomic class:* Mesic, uncoated Typic  
     Quartzipsamments

**Typical Pedon**

Boone loamy fine sand, 6 to 15 percent slopes, 525 feet south and 950 feet west of the northeast corner of sec. 2, T. 107 N., R. 10 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; neutral; clear smooth boundary.  
 C1—8 to 12 inches; dark brown (10YR 4/3) loamy fine sand; weak very fine granular structure; very friable; neutral; clear smooth boundary.  
 C2—12 to 18 inches; yellowish brown (10YR 5/4) loamy fine sand; weak very fine granular structure; very friable; neutral; clear smooth boundary.  
 C3—18 to 24 inches; yellowish brown (10YR 5/4) fine sand; single grain; loose; neutral; clear smooth boundary.  
 Cr—24 to 60 inches; very pale brown (10YR 7/3), weakly cemented sandstone; slightly acid.

**Range in Characteristics**

*Depth to sandstone:* 20 to 40 inches  
*Content of rock fragments:* 0 to 15 percent

*Ap horizon:*

Hue—10YR or 7.5YR  
 Value—3 or 4  
 Chroma—2 or 3

Texture—loamy fine sand or fine sandy loam

*C horizon:*

Hue—10YR or 7.5YR  
 Value—4 to 7  
 Chroma—3 to 6  
 Texture—sand, fine sand, loamy sand, or loamy fine sand

Taxadjunct features: The Boone soil in map unit 831F has more clay throughout and is shallower to sandstone than is defined as the range for the series. This difference, however, does not alter the usefulness or behavior of the soil.

**Boots Series**

*Depth class:* Very deep  
*Drainage class:* Very poorly drained  
*Permeability:* Moderately rapid or moderate  
*Landform:* Flood plains, terraces, and uplands  
*Parent material:* Partially decomposed reeds and sedges  
*Slope range:* 0 to 1 percent  
*Taxonomic class:* Euic, mesic Typic Medihemists

**Typical Pedon**

Boots muck, 2,550 feet south and 100 feet west of the northeast corner of sec. 27, T. 105 N., R. 7 W.

Oa—0 to 8 inches; sapric material, very dark brown (10YR 2/2) unrubbed, black (10YR 2/1) rubbed; estimated 40 percent fiber, 10 percent after rubbing; estimated 20 percent mineral material; primarily herbaceous fibers; neutral; gradual smooth boundary.  
 Oe—8 to 60 inches; hemic material, very dark brown (10YR 2/2) unrubbed, black (10YR 2/1) rubbed; estimated 50 percent fiber, 20 percent after rubbing; primarily herbaceous fibers; thin layer of silt loam less than 1 inch thick; neutral.

**Range in Characteristics***Organic material:*

Thickness—more than 51 inches  
 Kind—hemic or sapric  
 Hue—10YR or 7.5YR  
 Value—2 or 3  
 Chroma—1 to 3

**Brodale Series**

*Depth class:* Deep and very deep  
*Drainage class:* Excessively drained



*Permeability:* Moderate in the upper part; moderate or moderately rapid in the lower part

*Landform:* Uplands

*Parent material:* Residuum or colluvium

*Slope range:* 15 to 70 percent

*Taxonomic class:* Loamy-skeletal, carbonatic, mesic  
Entic Hapludolls

#### Typical Pedon

Brodale cobbly loam, rocky, 45 to 70 percent slopes, 175 feet east and 1,600 feet south of the northwest corner of sec. 15, T. 108 N., R. 10 W.

A1—0 to 7 inches; very dark grayish brown (10YR 3/2) cobbly loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure; very friable; about 25 percent coarse fragments; strong effervescence; mildly alkaline; clear smooth boundary.

A2—7 to 15 inches; very dark grayish brown (10YR 3/2) very cobbly silt loam, brown (10YR 5/3) dry; weak medium and fine subangular blocky structure; very friable; about 50 percent coarse fragments; violent effervescence; mildly alkaline; gradual wavy boundary.

C—15 to 60 inches; brown (10YR 5/3) very cobbly loam; massive; very friable; about 55 percent coarse fragments; violent effervescence; mildly alkaline.

#### Range in Characteristics

*Depth to bedrock:* 40 to 80 inches

*Thickness of the mollic epipedon:* 7 to 18 inches

##### A1 horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—cobbly loam or flaggy loam

Content of rock fragments—15 to 30 percent

##### A2 horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—the very cobbly analogs of silt loam, loam, very fine sandy loam, fine sandy loam, or sandy loam

Content of rock fragments—35 to 60 percent

##### C horizon:

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—3 to 6

Texture—the very gravelly or very cobbly analogs of loam, very fine sandy loam, fine sandy loam, or sandy loam

### Chaseburg Series

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Taxonomic class:* Coarse-silty, mixed, nonacid, mesic  
Typic Udifluvents

#### Typical Pedon

Chaseburg silt loam, channeled, 2,800 feet south and 50 feet east of the northwest corner of sec. 13, T. 107 N., R. 8 W.

A—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; very friable; slightly acid; abrupt smooth boundary.

C—7 to 60 inches; stratified dark grayish brown (10YR 4/2) silt loam and grayish brown (10YR 5/2) very fine sandy loam; massive; very friable; slightly acid.

#### Range in Characteristics

##### A horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

##### C horizon:

Hue—10YR

Value—4 to 6

Chroma—2 to 4

Texture—stratified silt loam, very fine sandy loam, or sand

### Comfrey Series

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Cumulic  
Haplaquolls

#### Typical Pedon

Comfrey silt loam, channeled, 2,100 feet east and 2,750 feet south of the northwest corner of sec. 35, T. 108 N., R. 8 W.

A1—0 to 12 inches; very dark gray (10YR 3/1) and black (10YR 2/1) silt loam, dark gray (10YR 4/1) and gray (10YR 5/1) dry; common fine distinct dark

brown (7.5YR 3/2) mottles; moderate fine subangular blocky structure; friable; neutral; clear smooth boundary.

A2—12 to 20 inches; very dark gray (10YR 3/1) silty clay loam; common fine distinct dark brown (10YR 3/3) mottles; weak medium subangular blocky structure; friable; neutral; clear smooth boundary.

A3—20 to 60 inches; very dark gray (2.5Y 3/1) loam; many medium distinct dark brown (7.5YR 3/3 and 4/4) mottles; weak fine subangular blocky structure; very friable; neutral.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 36 to more than 60 inches

#### A horizons:

Hue—10YR or 2.5Y

Value—2 or 3

Chroma—1 or 2

Texture—loam, clay loam, silt loam, or silty clay loam

#### C horizon:

Present in some pedons

### Dorerton Series

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; moderately rapid in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying colluvium

*Slope range:* 30 to 45 percent

*Taxonomic class:* Loamy-skeletal, mixed, mesic Typic Hapludalfs

#### Typical Pedon

Dorerton silt loam, in an area of Lamoille-Dorerton silt loams, 30 to 45 percent slopes; 100 feet east and 800 feet north of the southwest corner of sec. 6, T. 106 N., R. 7 W.

A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; very friable; neutral; clear smooth boundary.

E—4 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; dark grayish brown (10YR 4/2) coatings on faces of peds; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bt1—8 to 12 inches; dark brown (7.5YR 4/4) clay loam; moderate very fine and fine subangular blocky structure; friable; common distinct dark brown (7.5YR 3/2) clay films on faces of peds; about 5

percent gravel; neutral; clear smooth boundary.

2Bt2—12 to 24 inches; yellowish brown (10YR 5/4) very cobbly loam; moderate very fine and fine subangular blocky structure; friable; common thin clay films on faces of peds; common fine roots; about 55 percent cobbles and gravel; neutral; clear wavy boundary.

2C—24 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly loam; weak fine subangular blocky structure; very friable; about 70 percent cobbles and gravel; strong effervescence; mildly alkaline.

#### Range in Characteristics

*Depth to carbonates:* 16 to 45 inches

*Depth to bedrock:* 40 to more than 70 inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

#### E horizon:

Hue—10YR

Value—3 to 5

Chroma—2 or 3

Texture—silt loam

#### Bt horizon:

Hue—7.5YR or 10YR

Value—4 or 5

Chroma—3 or 4

Texture—loam or clay loam

Content of rock fragments—0 to 10 percent

#### 2Bt horizon:

Hue—7.5YR or 10YR

Value—4 or 5

Chroma—3 or 4

Texture—the very cobbly, very gravelly, or extremely cobbly analogs of loam or clay loam

Content of rock fragments—35 to 70 percent

#### 2C horizon:

Hue—10YR

Value—5 or 6

Chroma—3 or 4

Texture—the very cobbly, very gravelly, or extremely cobbly analogs of loam, fine sandy loam, or sandy loam

Content of rock fragments—35 to 70 percent

### Dunbarton Series

*Depth class:* Shallow

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying bedrock residuum

*Slope range:* 4 to 12 percent

*Taxonomic class:* Clayey, montmorillonitic, mesic Lithic Hapludalfs

#### Typical Pedon

Dunbarton silt loam, rocky, 4 to 12 percent slopes, 1,100 feet north and 1,200 feet west of the southeast corner of sec. 11, T. 106 N., R. 7 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine angular blocky structure; very friable; slightly acid; abrupt smooth boundary.

BE—7 to 10 inches; dark brown (10YR 4/3) silty clay loam; moderate fine angular blocky structure; friable; slightly acid; clear smooth boundary.

2Bt—10 to 18 inches; yellowish red (5YR 4/6) cherty clay; strong fine angular blocky structure; very firm; distinct nearly continuous reddish brown clay films on faces of peds and in pores; about 15 percent coarse fragments, mostly chert; slightly acid; clear wavy boundary.

R—18 inches; Oneota dolomite bedrock.

#### Range in Characteristics

*Depth to bedrock:* 12 to 20 inches

*Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

Content of rock fragments—0 to 10 percent

*E horizon:*

Present in some pedons

*BE horizon:*

Colors and textures similar to those of the Ap and 2Bt horizons

*2Bt horizon:*

Hue—10YR, 7.5YR, or 5YR

Value—4 or 5

Chroma—3 to 6

Texture—clay loam, clay, cherty clay loam, or cherty clay

Content of rock fragments—0 to 20 percent

### Eitzen Series

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 1 to 2 percent

*Taxonomic class:* Fine-silty, mixed, nonacid, mesic Mollic Udifluvents

#### Typical Pedon

Eitzen silt loam, channeled, 1,875 feet south and 750 feet east of the northwest corner of sec. 8, T. 106 N., R. 9 W.

C—0 to 28 inches; stratified black (10YR 2/1) and very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) dry; common thin strata of dark grayish brown (10YR 4/2) very fine sandy loam, light brownish gray (10YR 6/2) dry; weak very thin platy structure; laminated; very friable; slightly acid; abrupt smooth boundary.

Ab—28 to 47 inches; very dark brown (10YR 2/2) silt loam, very dark grayish brown (10YR 3/2) dry; weak fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

Btb—47 to 60 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; very friable; dark yellowish brown (10YR 4/4) coatings on faces of peds; few faint brown (10YR 4/3) clay films on faces of peds; medium acid.

#### Range in Characteristics

*Depth to buried soil:* 20 to 36 inches

*Ap, 2BC, and 2C horizons:* Present in some pedons

*C horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

*Ab horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Btb horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—3 or 4

Texture—silt loam or loam

Content of rock fragments—0 to 5 percent

### Elbaville Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately slow or moderate in the upper



part; moderately rapid in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying residuum

*Slope range:* 20 to 45 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Glossoboric  
Hapludalfs

### Typical Pedon

Elbaville silt loam, in an area of Elbaville-Seaton silt loams, 30 to 45 percent slopes; 1,800 feet north and 600 feet east of the southwest corner of sec. 6, T. 106 N., R. 7 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

E—4 to 15 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak thin and medium platy structure; very friable; dark brown (10YR 4/3) coatings on faces of peds; strongly acid; clear smooth boundary.

BE—15 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; very friable; strongly acid; clear smooth boundary.

Bt1—19 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium angular blocky structure; friable; faint brown (7.5YR 5/4) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—26 to 35 inches; dark brown (7.5YR 4/4) silty clay loam; strong medium and coarse angular blocky structure; firm; many prominent very dark grayish brown (10YR 3/2) clay films on faces of peds; about 10 percent dolomite and chert pebbles; neutral; clear wavy boundary.

3Bt3—35 to 52 inches; dark yellowish brown (10YR 4/4) very cobbly loam; weak coarse subangular blocky structure; friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; about 50 percent dolomite cobbles and pebbles; strongly effervescent; mildly alkaline; gradual smooth boundary.

3C—52 to 60 inches; yellowish brown (10YR 5/4) very cobbly loam; massive; very friable; about 50 percent dolomite cobbles and pebbles; slightly effervescent; mildly alkaline.

### Range in Characteristics

*Depth to carbonates:* 30 to 60 inches

*Thickness of the loess mantle:* 15 to 30 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*E horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—fine sandy loam, loam, or silt loam

*BE horizon:*

Colors and textures similar to those of the E and Bt horizons

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam or loam

Content of rock fragments—0 to 10 percent

*2Bt horizon:*

Hue—7.5YR or 10YR

Value—3 to 5

Chroma—3 or 4

Texture—clay loam, silty clay loam, or clay

Content of rock fragments—0 to 10 percent

*3Bt horizon:*

Colors and textures similar to those of the 2Bt and 3C horizons

*3C horizon:*

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—3 or 4

Texture—very cobbly loam, very cobbly sandy loam, cobbly loam, or cobbly sandy loam

Content of rock fragments—20 to 55 percent

**Taxadjunct features:** In this survey area the Elbaville soils do not have the interfingering of the E horizon into the Bt horizon that is typical of the series. This difference, however, does not alter the usefulness or behavior of the soils.

### Elewa Series

*Depth class:* Moderately deep

*Drainage class:* Somewhat excessively drained

*Permeability:* Moderate in the upper part; moderately rapid or rapid in the lower part

*Landform:* Uplands

*Parent material:* Loamy residuum

*Slope range:* 12 to 30 percent

*Taxonomic class:* Coarse-loamy, mixed, mesic Typic  
Hapludalfs

### Typical Pedon

Elewa cobbly silt loam, in an area of Elewa-Seaton

complex, 12 to 30 percent slopes; 500 feet south and 300 feet east of the center of sec. 9, R. 10 W., T. 100 N.

A—0 to 5 inches; grayish brown (10YR 4/2) cobbly silt loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; about 25 percent cobbles and channers of dolomite; strongly acid; clear wavy boundary.

E—5 to 9 inches; dark brown (10YR 4/3) cobbly loam, pale brown (10YR 6/3) dry; weak very fine and fine subangular blocky structure; very friable; about 25 percent cobbles and channers of dolomite; strongly acid; clear wavy boundary.

Bt1—9 to 18 inches; yellowish brown (10YR 5/6) cobbly fine sandy loam; moderate medium subangular blocky structure; few faint yellowish brown (10YR 5/4) coatings on faces of peds; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; very friable; about 25 percent cobbles and channers of dolomite; very strongly acid; clear wavy boundary.

Bt2—18 to 22 inches; yellowish brown (10YR 5/6) cobbly fine sandy loam; moderate medium subangular blocky structure; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; very friable; about 25 percent cobbles and channers of dolomite; strongly acid; abrupt wavy boundary.

BC—22 to 26 inches; brownish yellow (10YR 6/6) channery loamy fine sand; weak medium subangular blocky structure; very friable; about 20 percent channers and cobbles of sandstone and dolomite; strongly acid; abrupt smooth boundary.

Cr—26 to 60 inches; brownish yellow, weakly cemented sandstone.

#### Range in Characteristics

*Depth to bedrock:* 20 to 40 inches

##### *A horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—cobbly silt loam

Content of rock fragments—15 to 25 percent

##### *E horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—cobbly loam or cobbly fine sandy loam

Content of rock fragments—15 to 25 percent

##### *Bt horizon:*

Hue—10YR

Value—5 to 7

Chroma—5 or 6

Texture—cobbly loam or cobbly fine sandy loam

Content of rock fragments—15 to 25 percent

##### *BC horizon:*

Hue—10YR

Value—5 to 7

Chroma—5 or 6

Texture—channery loamy fine sand, cobbly loamy fine sand, cobbly loamy sand, or cobbly sand

Content of rock fragments—15 to 25 percent

##### *C horizon:*

Present in some pedons

### ***Eyota Series***

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid in the upper part; moderate in the lower part

*Landform:* Uplands

*Parent material:* Colluvial sediments

*Slope range:* 12 to 20 percent

*Taxonomic class:* Coarse-loamy, mixed, mesic Cumulic Hapludolls

#### Typical Pedon

Eyota fine sandy loam, 12 to 20 percent slopes, 1,890 feet east and 980 feet south of the northwest corner of sec. 12, T. 105 N., R. 10 W.

A—0 to 20 inches; very dark brown (10YR 2/2) fine sandy loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; strongly acid; clear smooth boundary.

AB—20 to 26 inches; dark brown (10YR 3/3) fine sandy loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; very dark brown (10YR 2/2) coatings on faces of peds; very friable; strongly acid; clear smooth boundary.

Bw1—26 to 48 inches; very dark brown (10YR 3/3) loam; weak medium subangular blocky structure; friable; very dark brown (10YR 2/2) coatings on faces of peds; strongly acid; clear smooth boundary.

2Bw2—48 to 57 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; dark brown (10YR 3/3) coatings on faces of peds; strongly acid; clear smooth boundary.

2Bw3—57 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium angular blocky structure; very friable; dark brown (10YR 4/3) coatings on faces of peds; medium acid.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 24 to 48 inches

*Content of rock fragments:* 0 to 10 percent

*A horizon:*

Hue—10YR  
 Value—2 or 3  
 Chroma—1 or 2  
 Texture—fine sandy loam

*AB horizon:*

Colors and textures similar to those of the A and B horizons

*B horizon:*

Hue—10YR  
 Value—3 or 4  
 Chroma—3 or 4  
 Texture—loam or silt loam

*C horizon:*

Present in some pedons

***Festina Series***

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Landform:* Terraces

*Parent material:* Alluvium

*Slope range:* 0 to 6 percent

*Taxonomic class:* Fine-silty, mixed, mesic Mollic Hapludalfs

**Typical Pedon**

Festina silt loam, 0 to 2 percent slopes, about 2,000 feet north and 2,620 feet east of the southwest corner of sec. 8, T. 108 N., R. 9 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; very friable; neutral; abrupt smooth boundary.

E—7 to 11 inches; brown (10YR 4/3) silt loam; weak thin platy structure; very friable; very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; clear smooth boundary.

BE—11 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and very fine subangular blocky structure; very friable; neutral; clear smooth boundary.

Bt1—14 to 20 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and fine subangular blocky structure; friable; light gray (10YR 7/2) silt coatings on faces of peds; common thin clay films on faces of peds; common fine roots; neutral; clear smooth boundary.

Bt2—20 to 32 inches; yellowish brown (10YR 5/4) silt loam; moderate medium and coarse subangular blocky structure; friable; few faint dark brown

(10YR 3/3) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt3—32 to 53 inches; light olive brown (2.5Y 5/4) silt loam; many fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; strongly acid; gradual smooth boundary.

BC—53 to 60 inches; light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/4) silt loam; many coarse distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure; very friable; medium acid.

**Range in Characteristics***Ap horizon:*

Hue—10YR  
 Value—2 or 3  
 Chroma—1 or 2  
 Texture—silt loam

*E horizon:*

Hue—10YR  
 Value—4 or 5  
 Chroma—2 or 3  
 Texture—silt loam

*BE horizon:*

Colors and textures similar to those of the E and B horizons

*B horizon:*

Hue—10YR or 2.5Y  
 Value—4 or 5  
 Chroma—2 to 5  
 Texture—silt loam or silty clay loam

*BC horizon:*

Hue—10YR or 2.5Y  
 Value—4 to 6  
 Chroma—2 to 4  
 Texture—silt loam

*C horizon:*

Present in some pedons

Taxadjunct features: The Festina soil in map unit 455B has a lighter colored A horizon than is defined as the range for the series. This difference, however, does not alter the usefulness or behavior of the soil.

***Finchford Series***

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Very rapid

*Landform:* Terraces

*Parent material:* Alluvium



*Slope range:* 0 to 2 percent

*Taxonomic class:* Sandy, mixed, mesic Entic Hapludolls

### Typical Pedon

Finchford sandy loam, in an area of Urban land-Finchford complex; 2,250 feet east and 2,050 feet south of the northwest corner of sec. 20, T. 107 N., R. 7 W.

A1—0 to 8 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak very fine granular structure; very friable; about 5 percent pebbles; slightly acid; clear smooth boundary.

A2—8 to 20 inches; black (10YR 2/1) loamy sand, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; about 10 percent pebbles; slightly acid; clear smooth boundary.

A3—20 to 26 inches; very dark brown (10YR 2/2) loamy sand, dark grayish brown (10YR 4/2) dry; single grain; very friable; about 10 percent pebbles; slightly acid; clear smooth boundary.

AB—26 to 33 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; very friable; about 14 percent gravel; slightly acid; clear smooth boundary.

Bw—33 to 37 inches; very dark brown (10YR 3/3) gravelly sand, pale brown (10YR 6/3) dry; single grain; loose; about 25 percent gravel; slightly acid; abrupt smooth boundary.

C—37 to 60 inches; brown (10YR 4/3) gravelly coarse sand; single grain; loose; about 25 percent gravel; neutral.

### Range in Characteristics

*Thickness of the mollic epipedon:* 16 to 33 inches

#### A1 horizon:

Hue—10YR

Value—2

Chroma—1 or 2

Texture—sandy loam

Content of rock fragments—5 to 15 percent

#### A2 and A3 horizons:

Hue—10YR

Value—2

Chroma—1 or 2

Texture—loamy sand, sand, gravelly loamy sand, or gravelly sand

Content of rock fragments—5 to 20 percent

#### AB horizon:

Colors and textures similar to those of the A and B horizons

#### B horizon:

Hue—10YR or 7.5YR

Value—3 to 5

Chroma—3 or 4

Texture—gravelly sand, gravelly coarse sand, loamy sand, or loamy coarse sand

Content of rock fragments—5 to 35 percent

#### C horizon:

Hue—10YR

Value—4 or 5

Chroma—3 to 6

Texture—gravelly sand, gravelly coarse sand, loamy sand, or loamy coarse sand

Content of rock fragments—5 to 35 percent

## Flagler Series

*Depth class:* Deep

*Drainage class:* Somewhat excessively drained

*Permeability:* Moderately rapid to very rapid in the upper part; moderately rapid to moderately slow in the lower part

*Landform:* Terraces and uplands

*Parent material:* Alluvium and mixed sediments over bedrock

*Slope range:* 0 to 6 percent

*Taxonomic class:* Coarse-loamy, mixed, mesic Typic Hapludolls

### Typical Pedon

Flagler sandy loam, bedrock substratum, 0 to 2 percent slopes, 1,200 feet east and 1,500 feet south of the northwest corner of sec. 21, T. 106 N., R. 10 W.

Ap—0 to 8 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; neutral; clear smooth boundary.

A—8 to 14 inches; very dark grayish brown (10YR 3/2) sandy loam; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bw1—14 to 21 inches; dark brown (10YR 4/3) sandy loam that has very dark grayish brown (10YR 3/2) ped exteriors; weak medium subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bw2—21 to 28 inches; dark brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; neutral; clear smooth boundary.

2BC—28 to 33 inches; yellowish brown (10YR 5/4) loamy sand; weak fine subangular blocky structure; very friable; about 10 percent fine gravel; slightly acid; clear smooth boundary.

2C1—33 to 40 inches; brownish yellow (10YR 6/6) loamy fine sand; weak medium subangular blocky structure; very friable; slightly acid; about 1 percent fine gravel; clear smooth boundary.

2C2—40 to 49 inches; stratified yellowish brown

(10YR 5/6) and dark brown (10YR 4/3) sandy loam and loamy sand; weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

3Bwb—49 to 51 inches; dark brown (10YR 4/3) loam; moderate fine subangular blocky structure; firm; slightly acid; abrupt smooth boundary.

3R—51 inches; very pale brown (10YR 7/3), fractured dolomite.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 10 to 24 inches

*Depth to bedrock:* 40 to 60 inches

##### *Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—sandy loam

##### *A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—sandy loam or fine sandy loam

##### *Bw horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 5

Texture—sandy loam

##### *2BC horizon:*

Colors and textures similar to those of the Bw and C horizons

##### *2C horizon:*

Hue—10YR, 5Y, or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—sandy loam, loamy sand, loamy fine sand, sand, fine sand, or the gravelly analogs of those textures

Content of rock fragments—0 to 20 percent

##### *3Bwb horizon:*

Hue—7.5Y, 10YR, 5Y, or 2.5Y

Value—3 to 6

Chroma—3 to 6

Texture—loam, clay loam, or clay

Content of rock fragments—0 to 5 percent

### Frankville Series

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying bedrock residuum

*Slope range:* 2 to 18 percent

*Taxonomic class:* Fine-silty, mixed, mesic Mollic Hapludalfs

#### Typical Pedon

Frankville silt loam, 2 to 6 percent slopes, 410 feet west and 1,820 feet north of the southeast corner of sec. 24, T. 106 N., R. 10 W.

Ap—0 to 7 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

BE—7 to 12 inches; dark yellowish brown (10YR 4/4) silt loam that has dark brown (10YR 3/3) ped exteriors; weak fine angular blocky structure; friable; medium acid; clear smooth boundary.

Bt1—12 to 19 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; dark grayish brown (10YR 4/2) and brown (10YR 4/3) clay films on faces of peds; few thin light gray (10YR 6/1) coatings of silt and very fine sand on faces of peds; strongly acid; clear smooth boundary.

Bt2—19 to 24 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; dark grayish brown (10YR 4/2) coatings of silt and very fine sand on faces of peds; few distinct dark brown (10YR 3/3) clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt3—24 to 34 inches; yellowish brown (10YR 5/6) clay; moderate coarse prismatic structure parting to strong fine angular blocky; firm; continuous prominent dark grayish brown (10YR 4/2) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt4—34 to 38 inches; yellowish brown (10YR 5/6) extremely flaggy clay; about 90 percent flagstones oriented like the underlying bedrock; clay films surrounding the fragments; firm; strongly effervescent; mildly alkaline; gradual smooth boundary.

2R—38 inches; fractured dolomite bedrock.

#### Range in Characteristics

*Thickness of the loess mantle:* 18 to 36 inches

*Depth to bedrock:* 20 to 40 inches

##### *Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*E horizon:*

Present in some pedons

*BE horizon:*

Colors and textures similar to those of the E and Bt horizons

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam, silty clay loam

*2Bt horizon:*

Hue—5YR, 7.5YR, 10YR, or 2.5Y

Value—4 to 6

Chroma—4 to 8

Texture—clay, flaggy clay, very flaggy clay, or extremely flaggy clay

Content of rock fragments—5 to 90 percent, increasing with depth

**Frontenac Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; moderately rapid in the lower part

*Landform:* Uplands

*Parent material:* Loess and colluvium

*Slope range:* 30 to 40 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Typic Hapludolls

**Typical Pedon**

Frontenac loam, 30 to 40 percent slopes, 2,700 feet north and 1,400 feet west of the southeast corner of sec. 5, T. 107 N., R. 8 W.

A—0 to 7 inches; very dark brown (10YR 2/2) loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; very friable; few thin black (10YR 2/1) coatings on faces of peds; about 3 percent cobbles and pebbles; neutral; clear smooth boundary.

AB—7 to 15 inches; dark brown (10YR 3/3) loam; weak fine subangular blocky structure; very friable; thin very dark grayish brown coatings on faces of peds; about 3 percent dolomite cobbles and pebbles; neutral; clear smooth boundary.

Bw1—15 to 27 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; very friable; thin dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) coatings on faces of peds; about 8 percent dolomite cobbles and pebbles; neutral; clear smooth boundary.

2Bw2—27 to 36 inches; yellowish brown (10YR 5/4)

very cobbly silt loam; weak fine subangular blocky structure; very friable; about 50 percent dolomite cobbles and pebbles; neutral; clear smooth boundary.

2C1—36 to 42 inches; light olive brown (2.5Y 5/4)

extremely cobbly silt loam; weak very fine subangular blocky structure; very friable; about 65 percent dolomite cobbles, flagstones, and pebbles; neutral; clear smooth boundary.

2C2—42 to 60 inches; light yellowish brown (2.5Y 6/4)

extremely cobbly loam; weak very fine subangular blocky structure; very friable; about 65 percent dolomite cobbles, flagstones, and pebbles; strong effervescence; mildly alkaline.

**Range in Characteristics**

*Depth to carbonates:* 18 to 60 inches

*Thickness of the mollic epipedon:* 10 to 18 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam

Content of rock fragments—0 to 10 percent

*AB horizon:*

Colors and textures similar to those of the A and B horizons

*B horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—loam, silt loam, or fine sandy loam

Content of rock fragments—0 to 15 percent

*2B horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—the cobbly or very cobbly analogs of silt loam, loam, or fine sandy loam

Content of rock fragments—15 to 60 percent

*2C horizon:*

Hue—2.5Y

Value—5 or 6

Chroma—3 to 5

Texture—the very cobbly or extremely cobbly analogs of sandy loam, silt loam, loam, or fine sandy loam

Content of rock fragments—35 to 70 percent

**Gale Series**

*Depth class:* Moderately deep

*Drainage class:* Well drained



*Permeability:* Moderate in the upper part; rapid in the lower part

*Landform:* Uplands

*Parent material:* Loess over residuum derived from sandstone

*Slope range:* 2 to 20 percent

*Taxonomic class:* Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs

#### Typical Pedon

Gale silt loam, in an area of Gale-Blackhammer silt loams, 6 to 12 percent slopes; 800 feet east and 1,200 feet north of the southwest corner of sec. 1, T. 107 N., R. 10 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine subangular blocky structure; very friable; neutral; clear smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; thin continuous clay films of dark yellowish brown (10YR 4/4) on faces of peds; slightly acid; clear smooth boundary.

Bt2—13 to 18 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few thin dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

BC—18 to 32 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; slightly acid; clear smooth boundary.

2C—32 to 38 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; slightly acid; clear smooth boundary.

2Cr—38 to 60 inches; yellowish brown (10YR 5/6), soft sandstone.

#### Range in Characteristics

*Depth to soft sandstone:* 30 to 40 inches

*Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

*E horizon:*

Present in some pedons

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam

*BC horizon:*

Colors and textures similar to those of the Bt and 2C horizons

*2C horizon:*

Hue—10YR

Value—4 to 6

Chroma—4 to 6

Texture—fine sand

### Garwin Series

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate

*Landform:* Terraces and uplands

*Parent material:* Loess

*Slope range:* 0 to 2 percent

*Taxonomic class:* Fine-silty, mixed, mesic Typic Haplaquolls

#### Typical Pedon

Garwin silt loam, 200 feet west and 1,850 feet north of the southeast corner of sec. 26, T. 105 N., R. 10 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; neutral; clear smooth boundary.

A1—9 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine angular blocky structure; friable; neutral; clear smooth boundary.

A2—16 to 24 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (10YR 5/1) dry; moderate fine angular blocky structure; firm; neutral; gradual smooth boundary.

A3—24 to 32 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine angular blocky structure; firm; thin nearly continuous black (10YR 2/0) clay films on peds and in pores; neutral; gradual smooth boundary.

AB—32 to 39 inches; very dark gray (10YR 3/1) silty clay loam that has few fine masses of dark gray (5Y 4/1); moderate medium prismatic structure; friable; neutral; clear smooth boundary.

Bg—39 to 46 inches; olive gray (5Y 5/2) silt loam; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

Cg—46 to 60 inches; light olive gray (5Y 6/2) silt loam; many medium prominent light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; friable; neutral.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 24 to 40 inches

*Ap horizon:*

Hue—10YR

Value—2 or 3  
 Chroma—1  
 Texture—silt loam

*A horizon:*

Hue—10YR  
 Value—2 or 3  
 Chroma—1  
 Texture—silty clay loam or silt loam

*Bg horizon:*

Hue—2.5Y or 5Y  
 Value—4 or 5  
 Chroma—1 or 2  
 Texture—silt loam

*Cg horizon:*

Hue—2.5Y or 5Y  
 Value—5 or 6  
 Chroma—1 or 2  
 Texture—silt loam

Taxadjunct features: The Garwin soils in this survey area have a thicker, darker surface soil than is defined as the range for the series. This difference, however, does not alter the usefulness or behavior of the soils.

## **Haverhill Series**

*Depth class:* Moderately deep

*Drainage class:* Very poorly drained

*Permeability:* Moderately slow in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loamy or clayey residuum over shale bedrock

*Slope range:* 1 to 8 percent

*Taxonomic class:* Fine, illitic (calcareous), mesic Typic Haplaquolls

### **Typical Pedon**

Haverhill mucky silty clay loam, 1 to 8 percent slopes, 2,520 feet north and 980 feet west of the southeast corner of sec. 29, T. 106 N., R. 10 W.

A1—0 to 4 inches; black (N 2/0) mucky silty clay loam, black (N 2/0) dry; weak very fine granular structure; sticky; neutral; clear smooth boundary.

A2—4 to 9 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; strong very fine granular structure; sticky; neutral; clear smooth boundary.

AB—9 to 14 inches; very dark gray (5Y 3/1) silty clay, gray (5Y 5/1) dry; strong very fine angular blocky structure; very sticky; neutral; clear smooth boundary.

Bg—14 to 30 inches; olive gray (5Y 5/2) clay; few

medium faint gray (2.5Y 5/1) and olive (5Y 5/4) mottles; weak coarse angular blocky structure; very sticky; neutral; gradual smooth boundary.

Cr1—30 to 48 inches; greenish gray (5GY 6/1), soft shale; common medium distinct olive (5Y 5/6) mottles; massive; very sticky; 5 percent coarse fragments; mildly alkaline; clear smooth boundary.

Cr2—48 to 60 inches; pale green (5G 6/2), soft shale; common medium distinct olive (5Y 5/6) mottles; massive; very sticky; 5 percent coarse fragments; mildly alkaline.

### **Range in Characteristics**

*Thickness of the mollic epipedon:* 8 to 20 inches

*Depth to soft shale:* 20 to 40 inches

*A1 horizon:*

Hue—10YR or neutral  
 Value—2 or 3  
 Chroma—0 or 1  
 Texture—mucky silty clay loam

*A2 horizon:*

Hue—10YR or neutral  
 Value—2 or 3  
 Chroma—0 or 1  
 Texture—mucky silty clay loam, silty clay loam, silty clay, or clay

*AB horizon:*

Colors and textures similar to those of the A and Bg horizons

*Bg horizon:*

Hue—2.5Y to 5G  
 Value—3 to 6  
 Chroma—1 to 4  
 Texture—silty clay or clay

Taxadjunct features: The Haverhill soils in this survey area do not have free carbonates and have more clay than is defined as the range for the series. These differences, however, do not alter the usefulness or behavior of the soils.

## **Haverhill Variant**

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loamy sediments and the underlying residuum

*Slope range:* 1 to 8 percent

*Taxonomic class:* Fine, illitic, mesic Typic Argiaquolls

### Typical Pedon

Haverhill Variant clay loam, 1 to 8 percent slopes, 900 feet east and 2,100 feet north of the southwest corner of sec. 36, T. 106 N., R. 10 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; moderate very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

2Bt1—8 to 13 inches; olive gray (5Y 4/2) clay; many fine prominent yellowish brown (10YR 5/8) mottles; moderate medium angular blocky structure; firm; common distinct dark gray (10YR 4/1) clay films on faces of peds; few distinct dark gray (10YR 4/1) clay films in pores; neutral; clear smooth boundary.

2Bt2—13 to 18 inches; pale olive (5Y 6/3) clay; common fine distinct light olive brown mottles; weak medium prismatic structure; very firm; few prominent black (10YR 2/1) organic or clay fillings in root channels; neutral; clear smooth boundary.

2C1—18 to 30 inches; stratified pale olive (5Y 6/4) clay and light olive brown (2.5Y 5/6) gravelly clay loam; weak medium prismatic structure; very firm; about 30 percent pebbles of dolomite in the clay loam; strong effervescence; mildly alkaline; clear smooth boundary.

2C2—30 to 60 inches; olive gray (5Y 4/2) clay that has few lenses of light olive brown (2.5Y 5/6) gravelly clay and clay loam; strong very fine angular blocky structure; very firm; about 20 percent dolomite pebbles in gravelly lenses; strong effervescence; mildly alkaline.

### Range in Characteristics

*Thickness of the mollic epipedon:* 7 to 12 inches

*Depth to bedrock:* More than 60 inches

#### Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—clay loam

#### 2Bt horizon:

Hue—2.5Y or 5Y

Value—4 to 6

Chroma—2 to 4

Texture—clay

Content of rock fragments—0 to 10 percent

#### 2C horizon:

Hue—2.5Y, 5Y, or 5GY

Value—4 to 6

Chroma—1 to 6

Texture—clay, gravelly clay loam, gravelly clay, or clay loam

Content of rock fragments—0 to 30 percent

### Hoopeston Series

*Depth class:* Deep and very deep

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderately rapid or rapid in the upper part; moderately slow or moderate in the lower part

*Landform:* Terraces and uplands

*Parent material:* Sandy and loamy sediments over sandstone

*Slope range:* 0 to 2 percent

*Taxonomic class:* Coarse-loamy, mixed, mesic Aquic Hapludolls

### Typical Pedon

Hoopeston sandy loam, bedrock substratum, 1,340 feet east and 1,360 feet south of the northwest corner of sec. 27, T. 106 N., R. 10 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) sandy loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; neutral; clear smooth boundary.

A—6 to 13 inches; very dark brown (10YR 2/2) sandy loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bw1—13 to 23 inches; dark grayish brown (10YR 4/2) sandy loam; many fine and medium prominent yellowish brown (10YR 5/8) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; very friable; about 2 percent pebbles; slightly acid; clear smooth boundary.

Bw2—23 to 30 inches; grayish brown (10YR 5/2) sandy loam; many fine and medium prominent yellowish brown (10YR 5/6) and dark brown (7.5YR 4/4) mottles; weak fine and medium subangular blocky structure; very friable; about 2 percent pebbles; slightly acid; clear smooth boundary.

Bw3—30 to 33 inches; brownish yellow (10YR 6/6) and light brownish gray (10YR 6/2) loamy sand; weak fine subangular blocky structure; very friable; few black manganese concretions; about 2 percent pebbles; strongly acid; clear smooth boundary.

C1—33 to 40 inches; light brownish gray (10YR 6/2) fine sand; many fine and medium prominent brownish yellow (10YR 6/6) mottles; single grain; loose; medium acid; clear smooth boundary.

C2—40 to 45 inches; stratified yellowish brown (10YR 5/6) and brownish yellow (10YR 6/8) clay loam and sandy clay loam that has thin strata of very pale brown (10YR 7/4) fine sand; massive in the finer textures and single grain in the sand; firm in the finer textures and loose in the sand; medium acid; clear smooth boundary.



2Cr—45 to 60 inches; white (10YR 8/1), fine grained, soft sandstone.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 10 to 20 inches

*Depth to bedrock:* 40 to 60 inches

*Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—sandy loam

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—sandy loam, fine sandy loam, or loam

*Bw horizon:*

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—sandy loam or loamy sand

Content of rock fragments—0 to 5 percent

*C horizon:*

Hue—10YR, 2.5Y, or 5Y

Value—5 to 8

Chroma—1 to 8

Texture—stratified sand to clay

Content of rock fragments—0 to 5 percent

### Huntsville Series

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Taxonomic class:* Fine-silty, mixed, mesic Cumulic Hapludolls

#### Typical Pedon

Huntsville silt loam, 900 feet west and 800 feet south of the northeast corner of sec. 13, T. 107 N., R. 8 W.

A1—0 to 12 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; very friable; neutral; abrupt smooth boundary.

A2—12 to 27 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; neutral; clear smooth boundary.

A3—27 to 46 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak very

fine subangular blocky structure; very friable; neutral; clear smooth boundary.

A4—46 to 50 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; neutral; clear smooth boundary.

A5—50 to 60 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; few fine distinct grayish brown (10YR 4/2) mottles on faces of peds; very friable; neutral.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 36 to 60 inches

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

### Kasson Series

*Depth class:* Very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate in the upper part; moderately slow in the lower part

*Landform:* Uplands

*Parent material:* Silty and loamy sediments and the underlying glacial till

*Slope range:* 1 to 3 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Aquollic Hapludalfs

#### Typical Pedon

Kasson silt loam, 650 feet north and 500 feet east of the southwest corner of sec. 3, T. 105 N., R. 9 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; very friable; medium acid; clear smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) silt loam; weak thin platy structure; very friable; medium acid; clear smooth boundary.

BE—12 to 17 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct grayish brown (2.5Y 5/2) mottles; weak fine angular blocky structure; friable; many grayish brown (10YR 5/2) uncoated sand and silt grains on faces of peds; about 2 percent coarse fragments; slightly acid; clear smooth boundary.

2Bt1—17 to 30 inches; light olive brown (2.5Y 5/4) loam; common fine distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; moderate medium angular blocky structure; friable; common grayish brown (10YR 5/2) silt and sand

grains on faces of peds and common thin clay films on faces of peds; common fine roots; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

2Bt2—30 to 41 inches; light olive brown (2.5Y 5/6) loam; common fine distinct light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; firm; few thick very dark grayish brown (10YR 3/2) clay films in pores and on faces of peds; about 2 percent coarse fragments; strongly acid; clear smooth boundary.

2BC—41 to 60 inches; light olive brown (2.5Y 5/6) loam that has thin lenses of sandy loam; common large distinct yellowish brown (10YR 5/8) and brown (7.5YR 4/4) and many medium distinct light brownish gray (2.5Y 6/2) mottles; weak coarse prismatic structure parting to weak coarse angular blocky; firm; about 2 percent coarse fragments; slightly acid.

#### Range in Characteristics

##### *A or Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

Content of rock fragments—0 to 5 percent

##### *E horizon (not in all pedons):*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

Content of rock fragments—0 to 5 percent

##### *BE horizon:*

Colors and textures similar to those of the E and Bt horizons

##### *2Bt horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—3 to 6

Texture—loam or sandy clay loam

Content of rock fragments—0 to 10 percent

##### *2BC horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—4 to 8

Texture—loam or sandy clay loam

Content of rock fragments—0 to 10 percent

##### *2C horizon:*

Present in some pedons

## Keltner Series

*Depth class:* Deep and very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying residuum

*Slope range:* 3 to 12 percent

*Taxonomic class:* Fine-silty, mixed, mesic Typic Argiudolls

#### Typical Pedon

Keltner silt loam, 6 to 12 percent slopes, 1,120 feet west and 1,200 feet south of the northeast corner of sec. 17, T. 105 N., R. 10 W.

A1—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

A2—9 to 16 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A3—16 to 20 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; black (10YR 2/1) coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—20 to 27 inches; dark brown (10YR 4/3) silt loam; moderate fine angular blocky structure; friable; dark grayish brown (10YR 3/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—27 to 35 inches; dark brown (10YR 4/3) silty clay loam; moderate fine angular blocky structure; friable; common faint dark grayish brown (10YR 3/2) clay films on faces of peds; medium acid; abrupt smooth boundary.

2Bt3—35 to 41 inches; light olive brown (2.5Y 5/6) and olive yellow (2.5Y 6/6) clay; strong fine angular blocky structure; very firm; many distinct very dark grayish brown (2.5Y 3/2) and dark grayish brown (2.5Y 4/2) clay films on faces of peds and in pores; neutral; clear smooth boundary.

2BC—41 to 47 inches; pale olive (5Y 6/4) clay; many medium distinct brownish yellow (10YR 5/8) mottles; weak coarse angular blocky structure; firm; neutral; abrupt smooth boundary.

2Cr—47 to 60 inches; olive yellow (5Y 6/4) shale that crushes to clay; common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; very firm; 10 percent dolomite fragments; strongly effervescent; mildly alkaline.

**Range in Characteristics***Thickness of the mollic epipedon:* 10 to 24 inches*Depth to bedrock:* 40 to 60 inches*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 to 5

Texture—silt loam or silty clay loam

*2Bt or 2BC horizon:*

Hue—2.5Y or 5Y

Value—4 to 6

Chroma—2 to 6

Texture—silty clay or clay

Content of rock fragments—0 to 10 percent

**Lacrescent Series***Depth class:* Deep and very deep*Drainage class:* Well drained*Permeability:* Moderate or moderately rapid in the upper part; moderately rapid in the lower part*Landform:* Uplands*Parent material:* Loess and colluvium*Slope range:* 20 to 70 percent*Taxonomic class:* Loamy-skeletal, mixed, mesic Typic Hapludolls**Typical Pedon**

Lacrescent silt loam, rocky, 45 to 70 percent slopes (fig. 9), 1,550 feet west and 2,530 feet south of the northeast corner of sec. 11, T. 106 N., R. 8 W.

A—0 to 10 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; about 5 percent cobbles and gravel; neutral; clear smooth boundary.

AB—10 to 18 inches; dark brown (10YR 3/3) cobbly silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; very dark grayish brown (10YR 3/2) coatings on faces of peds; friable; about 20 percent cobbles and gravel; neutral; clear smooth boundary.

Bw—18 to 25 inches; dark yellowish brown (10YR 4/4) very cobbly silt loam; weak medium subangular blocky structure; friable; about 45 percent cobbles and gravel; neutral; clear wavy boundary.

BC—25 to 32 inches; brown (10YR 5/3) very cobbly silt loam; weak medium subangular blocky structure;

friable; about 60 percent cobbles and gravel; slightly effervescent; mildly alkaline; clear wavy boundary.

C—32 to 60 inches; yellowish brown (10YR 5/4) very cobbly loam; massive; friable; about 60 percent cobbles and gravel; violently effervescent; moderately alkaline.

**Range in Characteristics***Thickness of the mollic epipedon:* 10 to 20 inches*Depth to bedrock:* 40 to more than 60 inches*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam, channery silt loam, or cobbly loam

*AB horizon:*

Colors and textures similar to those of the A and B horizons

*B horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—flaggy loam, very flaggy loam, cobbly silt loam, very cobbly silt loam, or extremely cobbly sandy loam

Content of rock fragments—10 to 70 percent, increasing with depth

*BC horizon:*

Colors and textures similar to those of the B and C horizons

*C horizon:*

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—3 or 4

Texture—very flaggy loam, very cobbly loam, very cobbly silt loam, or extremely cobbly sandy loam

Content of rock fragments—35 to 70 percent

**Lamoille Series***Depth class:* Deep and very deep*Drainage class:* Well drained*Permeability:* Moderate to slow in the upper part; moderately slow to moderately rapid in the lower part*Landform:* Uplands*Parent material:* Loess and the underlying residuum*Slope range:* 20 to 45 percent*Taxonomic class:* Fine, mixed, mesic Typic Hapludalfs





Figure 9.—Profile of Lacrescent silt loam, rocky, 45 to 70 percent slopes, over Oneota dolomite.

### Typical Pedon

Lamoille silt loam, in an area of Lamoille-Dorerton silt loams, 30 to 45 percent slopes; 25 feet east and 400 feet north of the southwest corner of sec. 6, T. 106 N., R. 7 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; very friable; about 4 percent cobbles and gravel; neutral; clear smooth boundary.

E—3 to 9 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak thin platy structure;

very friable; about 4 percent cobbles and pebbles; neutral; clear smooth boundary.

BE—9 to 12 inches; dark yellowish brown (10YR 4/4) and brown (10YR 5/3) silt loam; weak very fine subangular blocky structure; friable; about 4 percent cobbles and pebbles; slightly acid; clear smooth boundary.

2Bt1—12 to 15 inches; dark brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; common thin clay films on faces of peds; common fine roots; about 5 percent cobbles and pebbles; slightly acid; clear smooth boundary.

2Bt2—15 to 28 inches; reddish brown (5YR 4/4) cobbly



clay; strong medium and fine angular blocky structure; firm; many distinct dark reddish brown (5YR 3/4) clay films on faces of peds; about 20 percent pebbles and cobbles; neutral; clear wavy boundary.

3Bt3—28 to 42 inches; dark brown (7.5YR 4/4) very cobbly clay; moderate and weak fine and medium angular blocky structure; many distinct clay films on faces of peds; firm; about 50 percent pebbles and cobbles; slight effervescence in cobbles; neutral; clear wavy boundary.

3BC—42 to 53 inches; strong brown (7.5YR 5/6) extremely cobbly clay loam; weak medium subangular blocky structure; friable; about 70 percent pebbles and cobbles; slightly effervescent; moderately alkaline; clear wavy boundary.

3C—53 to 60 inches; yellowish brown (10YR 5/6) extremely cobbly loam; massive; friable; about 70 percent gravel and cobbles; strongly effervescent; moderately alkaline.

#### Range in Characteristics

*Depth to carbonates:* 30 to more than 60 inches

*Depth to bedrock:* 40 to more than 60 inches

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

Content of rock fragments—0 to 10 percent

#### E horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

#### BE horizon:

Colors and textures similar to those of the E and Bt horizons

#### Bt horizon:

Present in some pedons

#### 2Bt and 3Bt horizons:

Hue—5YR or 7.5YR

Value—4 to 6

Chroma—4 to 6

Texture—silty clay loam, clay, clay loam, or the cobbly, very cobbly, or extremely cobbly analogs of those textures

Content of rock fragments—10 to 70 percent, increasing with depth

#### 3BC horizon:

Colors and textures similar to those of the Bt and C horizons

#### 3C horizon:

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—4 to 6

Texture—the cobbly, very cobbly, or extremely cobbly analogs of loam or sandy loam

Content of rock fragments—30 to 80 percent

### Lawler Series

*Depth class:* Deep

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate in the upper part; very rapid in the lower part

*Landform:* Terraces and uplands

*Parent material:* Loamy alluvium over sandy sediments

*Slope range:* 0 to 2 percent

*Taxonomic class:* Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aquic Hapludolls

#### Typical Pedon

Lawler loam, bedrock substratum, 1,200 feet west and 700 feet north of the southeast corner of sec. 22, T. 106 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak very fine and fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A—8 to 12 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; medium acid; clear wavy boundary.

BA—12 to 16 inches; dark brown (10YR 4/3) and very dark grayish brown (10YR 3/2) loam; few fine faint dark grayish brown (10YR 4/2) and distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; medium acid; clear wavy boundary.

Bt—16 to 25 inches; dark yellowish brown (10YR 4/4) loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear wavy boundary.

BC—25 to 35 inches; light brownish gray (2.5Y 6/2) loam; many fine and medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; medium acid; abrupt wavy boundary.

2C1—35 to 41 inches; light gray (10YR 7/2) sand; single grain; loose; slightly acid; abrupt wavy boundary.

2C2—41 to 52 inches; white (10YR 8/1) fine sand that has thin layers of yellowish brown (10YR 5/4); single grain; loose; medium acid; abrupt wavy boundary.

3Cr—52 to 60 inches; white (10YR 8/1), fine grained sandstone.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 10 to 20 inches

*Depth to sandy sediments:* 24 to 40 inches

*Content of rock fragments:* 0 to 5 percent

*Depth to bedrock:* 40 to 60 inches

#### Ap horizon:

Hue—10YR

Value—2

Chroma—1 or 2

Texture—loam

#### A horizon:

Hue—10YR

Value—2

Chroma—1 or 2

Texture—loam or silt loam

#### BA horizon:

Colors and textures similar to those of the A and Bt horizons

#### Bt horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—loam

#### BC horizon:

Colors and textures similar to those of the Bt and C horizons

#### 2C horizon:

Hue—10YR or 2.5Y

Value—5 to 8

Chroma—1 to 4

Texture—fine sand or sand

### Lindstrom Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Silty sediments

*Slope range:* 1 to 20 percent

*Taxonomic class:* Fine-silty, mixed, mesic Cumulic  
Hapludolls

#### Typical Pedon

Lindstrom silt loam, 1 to 3 percent slopes, 1,900 feet

east and 885 feet south of the northwest corner of sec. 30, T. 107 N., R. 7 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; neutral; clear smooth boundary.

A1—9 to 30 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A2—30 to 36 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw1—36 to 45 inches; dark brown (10YR 3/3) silt loam that has very dark grayish brown (10YR 3/2) and very dark brown (10YR 2/2) ped exteriors; weak medium prismatic structure; friable; neutral; clear smooth boundary.

Bw2—45 to 60 inches; dark brown (10YR 4/3) silt loam that has dark brown (10YR 3/3) ped exteriors; weak coarse prismatic structure parting to weak medium and coarse subangular blocky; friable; neutral.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 24 to 54 inches

#### Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

#### A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or loam

#### Bw horizon:

Hue—10YR or 2.5Y

Value—3 to 5

Chroma—3 or 4

Texture—silt loam

### Littleton Series

*Depth class:* Very deep

*Drainage class:* Somewhat poorly drained

*Permeability:* Moderate

*Landform:* Terraces

*Parent material:* Alluvium

*Slope range:* 0 to 2 percent

*Taxonomic class:* Fine-silty, mixed, mesic Cumulic  
Hapludolls



**Typical Pedon**

Littleton silt loam, 100 feet west and 1,200 feet south of the northeast corner of sec. 16, T. 105 N., R. 8 W.

- Ap—0 to 8 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; weak medium granular structure; very friable; slightly acid; clear smooth boundary.
- A—8 to 35 inches; very dark brown (10YR 2/2) silt loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.
- Bw—35 to 48 inches; dark brown (10YR 4/3) silt loam; common fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; dark grayish brown (2.5Y 4/2) coatings on faces of peds; few faint clay films on faces of peds; slightly acid; clear smooth boundary.
- C—48 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; strong brown (7.5YR 4/6) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; slightly acid.

**Range in Characteristics**

*Thickness of the mollic epipedon:* 24 to 36 inches

*Ap or A horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—silt loam

*Bw horizon:*

Hue—10YR or 2.5Y  
Value—4 or 5  
Chroma—2 or 3  
Texture—silt loam or silty clay loam

*C horizon:*

Hue—2.5Y or 10YR  
Value—4 to 6  
Chroma—1 to 3  
Texture—silt loam

**Marshan Series**

*Depth class:* Very deep

*Drainage class:* Poorly drained

*Permeability:* Moderate in the upper part; rapid in the lower part

*Landform:* Terraces and uplands

*Parent material:* Loamy and silty material over mixed stratified sediments

*Slope range:* 0 to 2 percent

*Taxonomic class:* Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplaquolls

**Typical Pedon**

Marshan silt loam, loamy substratum, 600 feet south and 450 feet west of the northeast corner of sec. 27, T. 106 N., R. 9 W.

- Ap—0 to 8 inches; black (N 2/0) silt loam, gray (10YR 5/1) dry; common fine prominent dark brown (7.5YR 4/4) mottles; weak very fine subangular blocky structure; friable; strongly acid; clear smooth boundary.
- AB—8 to 17 inches; very dark gray (N 3/0) silt loam; common fine prominent dark yellowish brown (10YR 4/4) mottles; weak very fine subangular blocky structure; very friable; strongly acid; clear smooth boundary.
- Bg1—17 to 27 inches; gray (10YR 5/1) loam; many fine prominent yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; strongly acid; clear smooth boundary.
- Bg2—27 to 36 inches; gray (10YR 5/1) loam; many medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse angular blocky structure; friable; strongly acid; clear smooth boundary.
- 2Cg1—36 to 56 inches; gray (10YR 6/1) stratified sand and loamy sand that has thin lenses of sandy loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak very fine subangular blocky structure in the sandy loam and loamy sand and single grain in the sand; very friable in the sandy loam and loamy sand and loose in the sand; strongly acid; clear smooth boundary.
- 3Cg2—56 to 60 inches; stratified light greenish gray (5GY 7/1) and light gray (10YR 6/1) clay, sandy loam, sandy clay loam, loamy sand, and sand; many fine and medium prominent yellowish brown (10YR 5/8) mottles; loose in the loamy sand and sand and massive in the finer textured part; strongly acid.

**Range in Characteristics**

*Thickness of the mollic epipedon:* 12 to 24 inches

*Ap horizon:*

Hue—10YR or neutral  
Value—1 to 3  
Chroma—0 or 1  
Texture—silt loam

*AB horizon:*

Colors and textures similar to those of the Ap and Bg horizons

*Bg horizon:*

Hue—2.5Y, 5Y, or 10YR  
Value—4 or 5  
Chroma—1 or 2  
Texture—loam or silt loam

*2Cg horizon:*

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—1 to 4

Texture—stratified sand to sandy loam

Content of rock fragments—0 to 15 percent

*3Cg horizon:*

Hue—10YR to 5GY

Value—4 to 7

Chroma—1 to 4

Texture—stratified clay to fine sand

**Medary Series***Depth class:* Very deep*Drainage class:* Moderately well drained*Permeability:* Moderate and moderately slow in the upper part; slow in the lower part*Landform:* Terraces*Parent material:* Silty slack water deposits*Slope range:* 1 to 6 percent*Taxonomic class:* Fine, mixed, mesic Typic Hapludalfs**Typical Pedon**

Medary silt loam, 1 to 6 percent slopes, 500 feet east and 1,600 feet north of the southwest corner of sec. 29, T. 107 N., R. 7 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

BE—9 to 13 inches; dark brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bt1—13 to 20 inches; brown (10YR 5/3) silty clay that has dark brown (10YR 4/3) ped exteriors; few fine faint grayish brown (2.5Y 5/2) mottles; strong medium angular blocky structure; firm; many distinct clay films on faces of peds and in pores; medium acid; clear smooth boundary.

Bt2—20 to 38 inches; yellowish brown (10YR 5/4) silty clay that has dark yellowish brown (10YR 4/4) ped exteriors; strong medium prismatic structure; firm; many prominent clay films on faces of peds and in pores; medium acid; clear smooth boundary.

Bt3—38 to 56 inches; light olive brown (2.5Y 5/4), weakly stratified silty clay loam and silt loam; dark olive brown (2.5Y 4/4) ped exteriors; moderate medium prismatic structure; firm; many distinct clay films on faces of peds and in pores; medium acid; clear smooth boundary.

BC—56 to 60 inches; light brownish gray (2.5Y 6/2), stratified silty clay loam and silt loam; many fine

prominent yellowish brown (10YR 5/8) and dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; friable; few prominent black (10YR 2/1) clay films on faces of peds; neutral.

**Range in Characteristics***Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

*BE horizon:*

Colors and textures similar to those of the Ap horizon and the E horizon, if it occurs

*Bt horizon:*

Hue—7.5YR, 10YR, or 2.5Y

Value—4 or 5

Chroma—2 to 4

Texture—silt loam, silty clay loam, or silty clay

*BC horizon:*

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—2 to 4

Texture—stratified silty clay loam and silt loam

*C horizon:*

Present in some pedons

**Minneiska Series***Depth class:* Very deep*Drainage class:* Moderately well drained*Permeability:* Moderately rapid in the upper part; rapid in the lower part*Landform:* Flood plains*Parent material:* Alluvium*Slope range:* 0 to 2 percent*Taxonomic class:* Coarse-loamy, mixed (calcareous), mesic Mollic Udifluvents**Typical Pedon**

Minneiska fine sandy loam, channeled, 475 feet south and 1,850 feet east of the northwest corner of sec. 8, T. 107 N., R. 10 W.

A—0 to 8 inches; very dark brown (10YR 2/2) fine sandy loam; weak fine granular structure; very friable; slightly effervescent; mildly alkaline; clear smooth boundary.

C1—8 to 46 inches; stratified very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), dark grayish brown (10YR 4/2), and brown (10YR 5/3) silt loam, loam, sandy loam, fine sandy loam, and fine sand; laminated; very friable; massive; slightly

effervescent to strongly effervescent in parts; mildly alkaline; clear wavy boundary.

C2—46 to 60 inches; stratified very dark grayish brown, dark grayish brown (10YR 4/2), and brown (10YR 4/3) loamy fine sand and fine sand; massive and single grain; very friable, loose; strongly effervescent; mildly alkaline.

#### Range in Characteristics

Content of rock fragments: 0 to 10 percent

##### A horizon:

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—fine sandy loam

##### C horizon:

Hue—10YR or 2.5Y  
Value—2 to 5  
Chroma—2 or 3  
Texture—stratified silt loam to sand

### Minneopa Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderately rapid in the upper part; rapid in the lower part

Landform: Terraces

Parent material: Alluvium

Slope range: 0 to 2 percent

Taxonomic class: Sandy, mixed, mesic Aquic Hapludolls

#### Typical Pedon

Minneopa sandy loam, in an area of Urban land-Minneopa complex; 1,000 feet north and 1,700 feet east of the southwest corner of sec. 8, T. 107 N., R. 7 W.

A1—0 to 16 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak very fine subangular blocky structure; very friable; about 10 percent pebbles; neutral; clear smooth boundary.

A2—16 to 24 inches; very dark brown (10YR 2/2) gravelly sandy loam, dark grayish brown (10YR 4/2) dry; weak fine subangular blocky structure; very friable; about 15 percent pebbles; neutral; gradual smooth boundary.

Bw—24 to 27 inches; dark brown (10YR 3/3) gravelly coarse sand; single grain; loose; about 35 percent gravel; neutral; clear smooth boundary.

C—27 to 60 inches; light brownish gray (10YR 6/2) gravelly coarse sand; single grain; loose; about 25 percent gravel; neutral.

#### Range in Characteristics

Thickness of the mollic epipedon: 24 to 40 inches

##### A1 horizon:

Hue—10YR  
Value—2  
Chroma—1 or 2  
Texture—sandy loam  
Content of rock fragments—0 to 10 percent

##### A2 horizon:

Hue—10YR  
Value—2  
Chroma—1 or 2  
Texture—sandy loam, coarse sandy loam, gravelly sandy loam, or gravelly coarse sandy loam  
Content of rock fragments—0 to 35 percent

##### Bw horizon:

Hue—10YR or 7.5YR  
Value—3  
Chroma—2 or 3  
Texture—sandy loam, loamy coarse sand, coarse sand, or the gravelly analogs of those textures  
Content of rock fragments—0 to 35 percent

##### C horizon:

Hue—10YR or 2.5YR  
Value—4 to 6  
Chroma—2 or 3  
Texture—sand, coarse sand, very coarse sand, or the gravelly analogs of those textures  
Content of rock fragments—0 to 35 percent

### Mt. Carroll Series

Depth class: Very deep

Drainage class: Well drained

Permeability: Moderate

Landform: Uplands

Parent material: Loess

Slope range: 3 to 20 percent

Taxonomic class: Fine-silty, mixed, mesic Mollic Hapludalfs

#### Typical Pedon

Mt. Carroll silt loam, 6 to 12 percent slopes, 1,430 feet south and 627 feet east of the northwest corner of sec. 11, T. 106 N., R. 10 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

E—8 to 14 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; very friable; neutral; clear wavy boundary.

Bt1—14 to 30 inches; brown (10YR 5/3) silt loam; dark



yellowish brown (10YR 4/4) coatings on faces of peds; moderate medium subangular blocky structure; friable; common faint clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

Bt2—30 to 40 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse and medium subangular blocky structure; very friable; common faint clay films on faces of peds and in pores; slightly acid; clear wavy boundary.

BC—40 to 60 inches; yellowish brown (10YR 5/4) silt loam; dark yellowish brown (10YR 4/4) coatings on faces of peds; few fine distinct dark grayish brown (10YR 4/2) mottles; weak coarse subangular blocky structure; very friable; slightly acid.

#### Range in Characteristics

##### *Ap horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—2  
Texture—silt loam

##### *E horizon:*

Hue—10YR  
Value—4 to 6  
Chroma—2 to 4  
Texture—silt loam

##### *Bt horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 to 5  
Texture—silt loam

##### *BC horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 to 5  
Texture—silt loam

### **Nasset Series**

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying residuum

*Slope range:* 3 to 12 percent

*Taxonomic class:* Fine-silty, mixed, mesic Mollic Hapludalfs

#### Typical Pedon

Nasset silt loam, 3 to 6 percent slopes, 860 feet east

and 2,500 feet north of the southwest corner of sec. 19, T. 106 N., R. 9 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

EB—7 to 11 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bt1—11 to 23 inches; dark yellowish brown (10YR 4/4) silt loam that has dark brown (10YR 3/3) ped exteriors; moderate medium angular blocky structure; friable; common thin clay films on faces of peds; common fine roots; medium acid; clear smooth boundary.

Bt2—23 to 37 inches; yellowish brown (10YR 5/4) silt loam; moderate medium angular blocky structure; friable; few distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

2Bt3—37 to 45 inches; yellowish brown (10YR 5/8) clay; strong medium prismatic structure; firm; few prominent very dark grayish brown (10YR 3/2) clay films on faces of peds and in pores; few distinct coatings of light gray (10YR 7/1 dry) very fine sand on faces of peds; about 5 percent channers; slightly acid; clear smooth boundary.

2C—45 to 60 inches; light olive brown (2.5Y 5/8) extremely flaggy clay; moderate very fine subangular blocky structure; firm; about 90 percent dolomite fragments; strongly effervescent; mildly alkaline.

#### Range in Characteristics

*Depth to clayey-skeletal material:* 40 to 55 inches

##### *Ap horizon:*

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—silt loam  
Content of rock fragments—0 to 10 percent

##### *EB horizon:*

Colors and textures similar to those of the Ap and Bt horizons

##### *Bt horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 or 4  
Texture—silt loam  
Content of rock fragments—0 to 10 percent

##### *2Bt horizon:*

Hue—5YR to 2.5Y  
Value—4 to 6

Chroma—4 to 8  
 Texture—silty clay or clay  
 Content of rock fragments—0 to 10 percent

**2C horizon:**

Hue—5YR to 2.5Y  
 Value—4 to 6  
 Chroma—4 to 8  
 Texture—extremely flaggy clay, extremely flaggy silty clay, or extremely flaggy clay loam  
 Content of rock fragments—75 to 90 percent

## **Newalbin Series**

*Depth class:* Very deep  
*Drainage class:* Poorly drained and very poorly drained  
*Permeability:* Moderate  
*Landform:* Flood plains  
*Parent material:* Alluvium  
*Slope range:* 0 to 2 percent  
*Taxonomic class:* Coarse-silty, mixed, nonacid, mesic  
 Typic Fluvaquents

### **Typical Pedon**

Newalbin silt loam, channeled, 1,180 feet west and 1,550 feet north of the southeast corner of sec. 27, T. 105 N., R. 5 W.

A—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; neutral; clear smooth boundary.

Cg—7 to 26 inches; dark gray (10YR 4/1) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; weak thin platy structure; very friable; neutral; clear smooth boundary.

2Ab1—26 to 34 inches; black (N 2/0) silt loam; few fine distinct dark brown (10YR 4/4) mottles; weak very fine subangular blocky structure; very friable; neutral; clear smooth boundary.

2Ab2—34 to 39 inches; very dark gray (10YR 3/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/6) mottles; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

2Cgb—39 to 44 inches; dark gray (10YR 4/1) silt loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

3Ab—44 to 60 inches; black (N 2/0) silty clay loam; weak fine subangular blocky structure; friable; slightly acid.

### **Range in Characteristics**

*Depth to buried soil:* 20 to 40 inches

**A horizon:**

Hue—10YR  
 Value—2 or 3  
 Chroma—1 or 2  
 Texture—silt loam

**Cg or Cgb horizon:**

Hue—10YR or 2.5Y  
 Value—3 to 5  
 Chroma—1 or 2  
 Texture—silt loam, very fine sandy loam, fine sandy loam, or loamy very fine sand

**Ab horizon:**

Hue—10YR or neutral  
 Value—2 or 3  
 Chroma—0 or 1  
 Texture—loam, silt loam, sandy loam, or silty clay loam

**Taxadjunct features:** The Newalbin soils in this survey area have a dark surface layer and a buried soil that is within a depth of 40 inches. These differences are outside the range in characteristics for the series; however, they do not alter the usefulness or behavior of the soils.

## **NewGlarus Series**

*Depth class:* Moderately deep  
*Drainage class:* Well drained  
*Permeability:* Moderate or moderately slow in the upper part; slow in the lower part  
*Landform:* Uplands  
*Parent material:* Loess and the underlying bedrock residuum  
*Slope range:* 3 to 30 percent  
*Taxonomic class:* Fine-silty over clayey, mixed, mesic  
 Typic Hapludalfs

### **Typical Pedon**

NewGlarus silt loam, 12 to 20 percent slopes, 675 feet south and 325 feet east of the northwest corner of sec. 24, T. 107 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; slightly acid; abrupt smooth boundary.

BE—8 to 12 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bt1—12 to 22 inches; yellowish brown (10YR 5/4) silt loam; weak and moderate fine subangular blocky structure; very friable; faint dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—22 to 26 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; moderately thick dark brown (10YR 3/3) clay films on faces of peds and in pores; few faint dark yellowish brown (10YR 4/4) coatings on faces of peds; medium acid; abrupt smooth boundary.

2Bt3—26 to 36 inches; reddish brown (5YR 4/4) clay; weak fine subangular blocky structure; firm; common thin clay films on faces of peds; common fine roots; about 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

2R—36 to 60 inches; dolomite bedrock.

#### Range in Characteristics

*Depth to bedrock:* 20 to 40 inches

##### *Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

##### *BE horizon:*

Colors and textures similar to those of the Ap and Bt horizons

##### *Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam

##### *2Bt horizon:*

Hue—10YR to 5YR

Value—4 or 5

Chroma—3 to 5

Texture—clay or silty clay

Content of rock fragments—0 to 10 percent

### Nodine Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Loess and the underlying sediments derived from bedrock

*Slope range:* 4 to 20 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Typic Hapludalfs

#### Typical Pedon

Nodine silt loam, in an area of Nodine-Rollingstone silt loams, 12 to 20 percent slopes; 2,500 feet east and 200 feet south of the northwest corner of sec. 14, R. 5 W., T. 105 N.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; clear smooth boundary.

BE—6 to 10 inches; dark brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; friable; faint dark brown coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—10 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; few faint dark brown (10YR 3/3) clay films on faces of peds; about 5 percent cobbles and gravel; strongly acid; clear wavy boundary.

2Bt2—16 to 60 inches; stratified yellowish red (5YR 4/6 and 5/6) and strong brown (7.5YR 5/6) gravelly sandy clay, gravelly sandy clay loam, and gravelly sandy loam; thin seams of light brown (7.5YR 6/4) gravelly loamy sand and gravelly sand; weak and moderate medium and coarse subangular blocky structure; very friable to firm; about 30 percent coarse fragments; few distinct dark brown (10YR 3/3) clay films on faces of peds, mainly in the loamy and clayey parts; strongly acid.

#### Range in Characteristics

##### *Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—silt loam

Content of rock fragments—0 to 5 percent

##### *BE horizon:*

Colors and textures similar to those of the Ap and Bt horizons

##### *Bt horizon:*

Hue—10YR

Value—4

Chroma—3 or 4

Texture—silt loam

Content of rock fragments—0 to 5 percent

##### *2Bt horizon:*

Strata—variable in color, texture, and thickness

Hue—2.5YR to 10YR

Value—4 to 6

Chroma—4 to 6

Texture—clay loam to sand or the gravelly or cobbly analogs of the textures within that range

Content of rock fragments—5 to 35 percent

### Norden Series

*Depth class:* Deep and very deep

*Drainage class:* Well drained



*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Residuum and sediment weathered from sandstone

*Slope range:* 15 to 45 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Typic Hapludalfs

#### Typical Pedon

Norden silt loam, 15 to 30 percent slopes, 2,000 feet south and 800 feet east of the northwest corner of sec. 26, T. 105 N., R. 7 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; friable; neutral; clear smooth boundary.

BE—6 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

2Bt—15 to 27 inches; light olive brown (2.5Y 5/4) clay loam; moderate medium subangular blocky structure; friable; very few thin yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; abrupt smooth boundary.

2BC—27 to 42 inches; stratified olive yellow (2.5Y 6/6) and olive (5Y 4/6) loam and clay loam; weak fine and medium subangular blocky structure; friable; about 5 percent channers of sandstone; slightly acid; clear wavy boundary.

2Cr—42 to 60 inches; stratified, dark olive (5Y 4/4) and light olive brown (2.5Y 5/6), weathered glauconitic sandstone that crushes to very fine sandy loam; massive; friable; neutral.

#### Range in Characteristics

*Depth to carbonates:* 32 to 72 inches

*Depth to bedrock:* 40 to 72 inches

*Ap horizon:*

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

Content of rock fragments—0 to 10 percent

*BE horizon:*

Colors and textures similar to those of the Ap and Bt horizons

*2Bt horizon:*

Hue—10YR to 5Y

Value—4 to 6

Chroma—3 to 6

Texture—clay loam, sandy clay loam, loam, or silty clay loam

Content of rock fragments—0 to 15 percent

*2BC horizon:*

Hue—10YR to 5Y

Value—4 to 6

Chroma—4 to 6

Texture—stratified sandy loam to clay loam

#### Oronoco Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderately rapid in the upper part; moderate in the lower part

*Landform:* Uplands

*Parent material:* Eolian sediments

*Slope range:* 3 to 8 percent

*Taxonomic class:* Coarse-loamy, mixed, mesic Mollic Hapludalfs

#### Typical Pedon

Oronoco fine sandy loam, 3 to 8 percent slopes, 375 feet north and 50 feet west of the southeast corner of sec. 36, T. 106 N., R. 10 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine subangular blocky structure; very friable; neutral; clear smooth boundary.

E—8 to 12 inches; dark grayish brown (10YR 4/2) fine sandy loam; weak fine subangular blocky structure; very friable; neutral; clear smooth boundary.

BE—12 to 17 inches; brown (10YR 5/3) fine sandy loam; weak fine subangular blocky structure; very friable; continuous thin coatings of light gray (10YR 7/1 dry) clean sand and silt grains on faces of peds; neutral; clear smooth boundary.

Bt1—17 to 27 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate medium subangular blocky structure; very friable; many thin coatings of light gray (10YR 7/1 dry) sand and silt grains on faces of peds; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—27 to 38 inches; yellowish brown (10YR 5/4) fine sandy loam that has thin strata of yellowish brown (10YR 5/4) loamy fine sand; weak medium subangular blocky structure; very friable; few faint dark brown (10YR 3/3) clay films on faces of peds; neutral; clear smooth boundary.

Bt3—38 to 53 inches; yellowish brown (10YR 5/4) fine sandy loam; weak coarse subangular blocky structure; very friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; few faint dark yellowish brown (10YR 4/4) coatings on faces of peds; neutral; clear smooth boundary.

Bt4—53 to 60 inches; stratified, yellowish brown

(10YR 5/4) very fine sandy loam and silt loam; common fine distinct grayish brown (2.5Y 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very friable; few distinct dark brown (10YR 3/3) clay films on faces of peds; medium acid.

#### Range in Characteristics

##### *Ap horizon:*

Hue—10YR  
Value—3  
Chroma—2  
Texture—fine sandy loam

##### *E horizon:*

Hue—10YR  
Value—4  
Chroma—2  
Texture—fine sandy loam or loam

##### *BE horizon:*

Colors and textures similar to those of the E and Bt horizons

##### *Bt horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 or 4  
Texture—fine sandy loam, loam, silt loam, or very fine sandy loam

### Otter Series

*Depth class:* Very deep

*Drainage class:* Poorly drained and very poorly drained

*Permeability:* Moderate

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 1 percent

*Taxonomic class:* Fine-silty, mixed, mesic Cumulic Haplaquolls

#### Typical Pedon

Otter silt loam, 2,150 feet south and 525 feet west of the northeast corner of sec. 30, T. 105 N., R. 5 W.

A1—0 to 8 inches; black (N 2/0) silt loam, dark gray (10YR 4/0) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

A2—8 to 15 inches; black (N 2/0) silt loam; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A3—15 to 28 inches; very dark gray (10YR 3/1) silt loam; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Cg1—28 to 37 inches; dark gray (10YR 4/1) silt loam; many medium prominent yellowish brown

(10YR 5/8) mottles; massive; friable; slightly acid; clear smooth boundary.

Cg2—37 to 45 inches; gray (10YR 5/1) silt loam; many coarse prominent yellowish brown (10YR 5/8) mottles; massive; friable; slightly acid; clear smooth boundary.

Cg3—45 to 60 inches; greenish gray (5GY 5/1) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; slightly acid.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 24 to 40 inches

##### *A horizon:*

Hue—10YR or neutral  
Value—2 or 3  
Chroma—0 or 1  
Texture—silt loam or mucky silt loam

##### *C horizon:*

Hue—5GY to 10YR or neutral  
Value—4 or 5  
Chroma—0 to 2  
Texture—silt loam, loam, or silty clay loam

### Palsgrove Series

*Depth class:* Deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying bedrock residuum

*Slope range:* 2 to 20 percent

*Taxonomic class:* Fine-silty, mixed, mesic Typic Hapludalfs

#### Typical Pedon

Palsgrove silt loam, 6 to 12 percent slopes, 70 feet east and 2,480 feet south of the northwest corner of sec. 11, T. 107 N., R. 9 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bt1—9 to 21 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine angular blocky structure; friable; common thin clay films on faces of peds; common fine roots; strongly acid; clear smooth boundary.

Bt2—21 to 29 inches; yellowish brown (10YR 5/4) silt loam; moderate medium angular blocky structure; friable; dark yellowish brown (10YR 4/4) coatings on faces of peds; few faint dark brown (10YR 3/3) clay

films on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt3—29 to 41 inches; yellowish brown (10YR 5/4) silt loam; moderate coarse subangular blocky structure; friable; dark yellowish brown (10YR 4/4) coatings on faces of peds; few distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; strongly acid; clear smooth boundary.

2Bt4—41 to 52 inches; dark brown (7.5YR 4/4) clay; strong medium prismatic structure; firm; many prominent dark brown (10YR 3/3) clay films on faces of peds and in pores; few fragments of dolomite in the lower part; strongly acid; abrupt wavy boundary.

2R—52 inches; very pale brown, fractured, hard dolomite bedrock.

#### Range in Characteristics

*Depth to bedrock:* 40 to 60 inches

*Ap horizon:*

Hue—10YR  
Value—2 to 4  
Chroma—1 to 3  
Texture—silt loam

*Bt horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 or 4  
Texture—silt loam

*2Bt horizon:*

Hue—5YR to 10YR  
Value—3 to 5  
Chroma—3 to 6  
Texture—silty clay or clay  
Content of rock fragments—0 to 15 percent

#### Plainfield Series

*Depth class:* Very deep

*Drainage class:* Excessively drained

*Permeability:* Rapid

*Landform:* Terraces and uplands

*Parent material:* Sandy sediments

*Slope range:* 1 to 50 percent

*Taxonomic class:* Mixed, mesic Typic Udipsamments

#### Typical Pedon

Plainfield sand, 6 to 12 percent slopes, 1,825 feet south and 700 feet east of the northwest corner of sec. 6, T. 108 N., R. 9 W.

Ap—0 to 8 inches; dark brown (10YR 3/3) sand, light brownish gray (10YR 6/2) dry; weak very fine granular structure; very friable; dark grayish brown

(10YR 4/2) coatings on faces of peds; medium acid; clear smooth boundary.

Bw—8 to 31 inches; yellowish brown (10YR 5/4) sand; weak very fine subangular blocky structure; very friable; strongly acid; gradual smooth boundary.

C1—31 to 45 inches; brownish yellow (10YR 6/6) sand; single grain; loose; medium acid; gradual smooth boundary.

C2—45 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; medium acid.

#### Range in Characteristics

*Content of rock fragments:* 0 to 15 percent

*Ap horizon:*

Hue—10YR  
Value—3 or 4  
Chroma—2 or 3  
Texture—sand

*B horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—4 to 6  
Texture—sand, fine sand, or coarse sand

*C horizon:*

Hue—10YR  
Value—5 or 6  
Chroma—4 to 7  
Texture—sand, fine sand, or coarse sand

#### Port Byron Series

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Loess

*Slope range:* 1 to 12 percent

*Taxonomic class:* Fine-silty, mixed, mesic Typic Hapludolls

#### Typical Pedon

Port Byron silt loam, 3 to 6 percent slopes, 1,170 feet west and 2,300 feet north of the southeast corner of sec. 15, T. 105 N., R. 10 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; weak very fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

A1—9 to 12 inches; black (10YR 2/1) silt loam, gray (10YR 5/1) dry; moderate fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

A2—12 to 16 inches; very dark grayish brown



(10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate very fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw1—16 to 20 inches; dark brown (10YR 4/3) silt loam that has dark brown (10YR 3/3) ped exteriors; moderate fine subangular blocky structure; friable; medium acid; clear wavy boundary.

Bw2—20 to 26 inches; dark yellowish brown (10YR 4/4) silt loam that has dark brown (10YR 3/3) ped exteriors; moderate fine subangular blocky structure; friable; medium acid; clear smooth boundary.

Bw3—26 to 33 inches; yellowish brown (10YR 5/4) silt loam that has dark brown (10YR 4/3) ped exteriors; weak medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

BC—33 to 42 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; medium acid; gradual smooth boundary.

C—42 to 60 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; medium acid.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 10 to 16 inches

##### A horizon:

Hue—10YR  
Value—2 or 3  
Chroma—1 or 2  
Texture—silt loam

##### Bw horizon:

Hue—10YR  
Value—4 or 5  
Chroma—3 or 4  
Texture—silt loam

##### BC horizon:

Colors and textures similar to those of the Bw and C horizons

##### C horizon:

Hue—10YR or 2.5Y  
Value—5 or 6  
Chroma—2 to 4  
Texture—silt loam

### Racine Series

*Depth class:* Deep and very deep

*Drainage class:* Moderately well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Silty and loamy sediments and the underlying glacial till (fig. 10)

*Slope range:* 2 to 12 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Mollic Hapludalfs

#### Typical Pedon

Racine silt loam, 2 to 6 percent slopes, 1,300 feet west and 50 feet south of the northeast corner of sec. 30, T. 106 N., R. 9 W.

A—0 to 5 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak very fine subangular blocky structure and weak thin platy structure; very friable; neutral; clear smooth boundary.

E—5 to 9 inches; dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; moderate thin platy structure; very friable; strongly acid; clear smooth boundary.

BE—9 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; friable; very dark grayish brown (10YR 3/2) coatings on faces of peds; very strongly acid; clear smooth boundary.

Bt1—13 to 18 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few faint dark brown (10YR 4/3) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Bt2—18 to 30 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent pebbles; very strongly acid; clear smooth boundary.

2Bt3—30 to 36 inches; yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent coarse fragments; very strongly acid; clear smooth boundary.

2Bt4—36 to 49 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct olive gray (5Y 5/2) mottles; moderate very coarse angular blocky structure; firm; common prominent black (10YR 2/1) clay films in pores and on faces of peds; about 3 percent coarse fragments; strongly acid; clear smooth boundary.

2C—49 to 60 inches; yellowish brown (10YR 5/6) loam; common fine prominent grayish brown (10YR 5/2) and gray (10YR 6/1) mottles; weak coarse subangular blocky structure; firm; about 3 percent coarse fragments; mildly alkaline.





**Figure 10.—Profile of Racine silt loam, 2 to 6 percent slopes. This soil formed in silty and loamy sediments and in the underlying glacial till. The light-colored material below the soil is the St. Peter Sandstone Formation.**

**Range in Characteristics**

*Depth to carbonates:* 40 to 70 inches

*Ap horizon:*

Present in some pedons

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

Content of rock fragments—0 to 2 percent

*E horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—loam or silt loam

Content of rock fragments—0 to 2 percent

*BE horizon:*

Colors and textures similar to those of the Bt and E horizons

*Bt horizon:*

Hue—10YR

Value—4

Chroma—3 or 4

Texture—silt loam or loam

Content of rock fragments—0 to 2 percent

*2Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—4 to 6

Texture—loam, sandy clay loam, or clay loam

Content of rock fragments—2 to 10 percent

*2BC horizon (not in all pedons):*

Colors and textures similar to those of the 2Bt and 2C horizons

*2C horizon:*

Hue—10YR to 5Y

Value—5 or 6

Chroma—3 to 8

Texture—loam, clay loam, or sandy clay loam

Content of rock fragments—2 to 10 percent

## **Rockton Series**

*Depth class:* Moderately deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Loamy sediments and the underlying bedrock residuum

*Slope range:* 1 to 6 percent

*Taxonomic class:* Fine-loamy, mixed, mesic Typic Argiudolls

### **Typical Pedon**

Rockton silt loam, 1 to 6 percent slopes, 500 feet north and 75 feet west of the southeast corner of sec. 29, T. 106 N., R. 9 W.

Ap—0 to 9 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

A—9 to 13 inches; very dark grayish brown (10YR 3/2)

loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

Bt1—13 to 22 inches; dark yellowish brown (10YR 4/4) loam; weak medium angular blocky structure; friable; brown (10YR 4/3) clay films on faces of peds; medium acid; clear smooth boundary.

2Bt2—22 to 27 inches; yellowish brown (10YR 5/6) clay loam; weak coarse angular blocky structure; firm; common thin clay films on faces of peds; common fine roots; medium acid; abrupt wavy boundary.

2R—27 inches; very pale brown (10YR 7/3), fractured, hard dolomite bedrock.

### **Range in Characteristics**

*Thickness of the mollic epipedon:* 10 to 18 inches

*Depth to bedrock:* 20 to 40 inches

*Content of rock fragments:* 0 to 5 percent

*Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

*A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or loam

*Bt horizon:*

Hue—10YR

Value—4 or 5

Chroma—4

Texture—loam, clay loam, or silt loam

*2Bt horizon:*

Hue—7.5YR or 10YR

Value—4 to 6

Chroma—4 to 6

Texture—clay loam or clay

## **Rollingstone Series**

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; slow in the lower part

*Landform:* Uplands

*Parent material:* Loess and the underlying residuum

*Slope range:* 3 to 20 percent

*Taxonomic class:* Very fine, mixed, mesic Typic Paleudalfs

### **Typical Pedon**

Rollingstone silt loam, 12 to 20 percent slopes, 1,000



feet east and 700 feet south of the northwest corner of sec. 2, T. 105 N., R. 5 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

BE—5 to 10 inches; dark yellowish brown (10YR 4/4) silt loam; few masses of dark brown (10YR 4/3) and common faint dark brown (10YR 4/3) coatings on faces of peds; moderate fine subangular blocky structure; friable; medium acid; clear smooth boundary.

2Bt—10 to 60 inches; yellowish red (5YR 4/6) cherty clay; strong fine angular blocky structure; very firm; common distinct clay films on faces of peds and in pores; about 20 percent angular chert fragments; strongly acid.

#### Range in Characteristics

*Thickness of the loess:* 5 to 15 inches

##### *Ap horizon:*

Hue—10YR  
Value—3 or 4  
Chroma—2 or 3  
Texture—silt loam

##### *BE horizon:*

Hue—10YR  
Value—3 or 4  
Chroma—4 to 6  
Texture—silt loam

##### *2Bt horizon:*

Hue—2.5YR to 7.5YR  
Value—4 to 6  
Chroma—4 to 6  
Texture—cherty clay or clay  
Content of rock fragments—2 to 30 percent

Taxadjunct features: The Rollingstone soils in map units 586C and 586D have less clay in the 2Bt horizon than is defined as the range for the series. This difference, however, does not alter the usefulness or behavior of the soils.

### Seaton Series

*Depth class:* Very deep

*Drainage class:* Well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Loess

*Slope range:* 1 to 45 percent

*Taxonomic class:* Fine-silty, mixed, mesic Typic  
Hapludalfs

#### Typical Pedon

Seaton silt loam, 6 to 12 percent slopes, 2,125 feet north and 2,250 feet west of the southeast corner of sec. 23, T. 107 N., R. 10 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; few masses of brown (10YR 4/3); weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

BE—8 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

Bt1—14 to 31 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine angular blocky structure; friable; few faint dark brown (10YR 3/3) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—31 to 39 inches; yellowish brown (10YR 5/4) silt loam; dark yellowish brown (10YR 4/4) coatings on faces of peds; weak medium subangular blocky structure; very friable; strongly acid; clear smooth boundary.

BC—39 to 46 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; very friable; medium acid; clear smooth boundary.

C—46 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; very friable; medium acid.

#### Range in Characteristics

##### *Ap horizon:*

Hue—10YR  
Value—3 or 4  
Chroma—2 or 3  
Texture—silt loam

##### *E horizon:*

Present in some pedons

##### *BE horizon:*

Colors and textures similar to those of the Ap and Bt horizons

##### *Bt horizon:*

Hue—10YR  
Value—4 or 5  
Chroma—3 or 4  
Texture—silt loam

##### *BC horizon:*

Colors and textures similar to those of the Bt and C horizons

##### *C horizon:*

Hue—10YR or 2.5Y  
Value—5 or 6  
Chroma—2 to 4  
Texture—silt loam

Taxadjunct features: The Seaton soil in map unit 815F contains more sand in the solum than is defined as the range for the series. This difference, however, does not alter the usefulness or behavior of the soil.

### **Shiloh Series**

*Depth class:* Very deep

*Drainage class:* Very poorly drained

*Permeability:* Moderate in the upper part; moderately slow in the lower part

*Landform:* Flood plains

*Parent material:* Alluvium

*Slope range:* 0 to 1 percent

*Taxonomic class:* Fine, montmorillonitic, mesic Cumulic Haplaquolls

#### **Typical Pedon**

Shiloh silt loam, ponded, 500 feet east and 1,400 feet north of the southwest corner of sec. 35, T. 108 N., R. 8 W.

A1—0 to 12 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; many fine and medium distinct dark brown (10YR 3/3) and strong brown (10YR 5/6) mottles; weak very fine subangular blocky structure; sticky; slightly acid; gradual smooth boundary.

A2—12 to 24 inches; very dark gray (N 3/0) silty clay loam; weak fine subangular blocky structure; sticky; slightly acid; gradual smooth boundary.

Bg—24 to 60 inches; very dark gray (N 3/0) silty clay; few fine prominent olive (5Y 4/4) mottles; weak medium subangular blocky structure; very sticky; neutral.

#### **Range in Characteristics**

*Thickness of the mollic epipedon:* More than 36 inches

##### *A1 horizon:*

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silt loam

##### *A2 horizon:*

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4

Chroma—0 or 1

Texture—silty clay or silty clay loam

##### *Bg horizon:*

Hue—10YR, 2.5Y, 5Y, or neutral

Value—3 or 4

Chroma—0 or 1

Texture—silty clay or silty clay loam

### **Sogn Series**

*Depth class:* Very shallow and shallow

*Drainage class:* Somewhat excessively drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Thin mantle of residuum over bedrock

*Slope range:* 1 to 45 percent

*Taxonomic class:* Loamy, mixed, mesic Lithic Haplustolls

#### **Typical Pedon**

Sogn silt loam, 1 to 6 percent slopes, 20 feet south and 200 feet west of the northeast corner of sec. 32, T. 106 N., R. 9 W.

Ap—0 to 8 inches; black (10YR 2/1) silt loam; weak very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A1—8 to 12 inches; very dark brown (10YR 2/2) silt loam; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.

A2—12 to 16 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; about 2 percent dolomite pebbles; neutral; clear smooth boundary.

2C—16 to 19 inches; very dark grayish brown (10YR 3/2) and pale brown (10YR 6/3) extremely gravelly loam; massive; very friable; about 90 percent dolomite pebbles; neutral; abrupt smooth boundary.

2R—19 to 60 inches; very pale brown (10YR 6/3) dolomite bedrock.

#### **Range in Characteristics**

*Thickness of the mollic epipedon:* 8 to 20 inches

*Depth to bedrock:* 4 to 20 inches

##### *Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam or flaggy silt loam

Content of rock fragments—0 to 30 percent

##### *A horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—loam, silt loam, or the flaggy analogs of those textures

Content of rock fragments—0 to 30 percent

##### *2C horizon (not in all pedons):*

Hue—10YR

Value—3 to 6

Chroma—2 to 8

Texture—the very gravelly, very flaggy, or extremely

gravelly analogs of loam, silt loam, or silty clay loam

Content of rock fragments—50 to 90 percent

**Taxadjunct features:** The Sogn soils in this survey area are taxadjuncts because they have a udic moisture regime. The Sogn soil in map unit 831F is shallower to carbonates and has more clay and a higher content of channers in the solum than is typical for the series. These differences, however, do not alter the usefulness or behavior of the soils.

### **Southridge Series**

**Depth class:** Very deep

**Drainage class:** Well drained

**Permeability:** Moderate in the upper part; slow in the lower part

**Landform:** Uplands

**Parent material:** Loess and the underlying residuum

**Slope range:** 2 to 20 percent

**Taxonomic class:** Fine-silty over clayey, mixed, mesic Typic Paleudalfs

#### **Typical Pedon**

Southridge silt loam, 6 to 12 percent slopes, 750 feet south and 1,575 feet east of the northwest corner of sec. 28, T. 105 N., R. 5 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

BE—9 to 14 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; very friable; medium acid; clear smooth boundary.

Bt1—14 to 29 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; very friable; common thin clay films on faces of peds; common fine roots; strongly acid; clear smooth boundary.

2Bt2—29 to 60 inches; yellowish red (5YR 4/6) clay; strong coarse angular blocky structure; very firm; few thin clay films on faces of peds and in pores; about 5 percent chert fragments; very strongly acid.

#### **Range in Characteristics**

**Thickness of the loess:** 20 to 40 inches

**Ap horizon:**

Hue—10YR

Value—2 or 3

Chroma—2 or 3

Texture—silt loam

**E horizon:**

Present in some pedons

**BE horizon:**

Colors and textures similar to those of the Ap and Bt horizons

**Bt horizon:**

Hue—10YR or 7.5YR

Value—4 or 5

Chroma—3 or 4

Texture—silt loam or silty clay loam

**2Bt horizon:**

Hue—5YR or 7.5YR

Value—4 to 6

Chroma—4 to 6

Texture—clay or cherty clay

Content of rock fragments—5 to 25 percent

### **Spinks Series**

**Depth class:** Deep

**Drainage class:** Well drained

**Permeability:** Rapid in the upper part; moderately rapid in the lower part

**Landform:** Uplands

**Parent material:** Sandy sediments over sandstone

**Slope range:** 1 to 25 percent

**Taxonomic class:** Sandy, mixed, mesic Psammentic Hapludalfs

#### **Typical Pedon**

Spinks loamy fine sand, bedrock substratum, 1 to 6 percent slopes, 1,300 feet east and 50 feet north of the center of sec. 27, T. 106 N., R. 10 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak very fine granular structure; very friable; slightly acid; clear smooth boundary.

E1—9 to 18 inches; dark brown (10YR 4/3) loamy fine sand; weak fine subangular blocky structure; very friable; strongly acid; clear smooth boundary.

E2—18 to 30 inches; yellowish brown (10YR 5/4) loamy fine sand; weak fine granular structure; strongly acid; clear wavy boundary.

E&Bt—30 to 54 inches; light yellowish brown (10YR 6/4) fine sand (E); lamellae of yellowish brown (10YR 5/6) loamy fine sand (Bt) 1 to 2 inches thick; single grain in the E part and weak fine subangular blocky structure in the Bt part; very friable; weak clay bridges between sand grains; strongly acid; clear smooth boundary.

2Cr—54 to 60 inches; white (10YR 8/1), weakly cemented sandstone.

#### **Range in Characteristics**

**Depth to bedrock:** 40 to 60 inches



*Ap horizon:*

Hue—10YR

Value—3 or 4

Chroma—2 or 3

Texture—loamy fine sand

*E horizon:*

Hue—10YR

Value—4 to 6

Chroma—3 to 6

Texture—sand, fine sand, loamy sand, or loamy fine sand

*E&Bt horizon:*

Colors and textures similar to those of the E and Bt horizons

*Bt horizon* (not in all pedons):

Hue—10YR

Value—4 to 6

Chroma—4 to 6

Texture—loamy sand, loamy fine sand, or sandy loam

**Timula Series***Depth class:* Very deep*Drainage class:* Well drained*Permeability:* Moderate*Landform:* Uplands*Parent material:* Loess*Slope range:* 6 to 60 percent*Taxonomic class:* Coarse-silty, mixed, mesic Typic Eutrochrepts**Typical Pedon**

Timula silt loam, 20 to 40 percent slopes, eroded, 1,800 feet north and 600 feet east of the southwest corner of sec. 35, T. 105 N., R. 5 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; very friable; slightly acid; clear smooth boundary.

Bw1—9 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; weak very fine subangular blocky structure; very friable; few faint dark brown (10YR 4/3) coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—20 to 28 inches; dark yellowish brown (10YR 4/4) silt loam; common fine distinct grayish brown (2.5Y 5/2) mottles; weak fine subangular blocky structure; very friable; slightly acid; clear smooth boundary.

BC—28 to 32 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky

structure; very friable; slightly acid; clear smooth boundary.

C—32 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; strongly effervescent; mildly alkaline.

**Range in Characteristics***Depth to carbonates:* 18 to 36 inches*A horizon:*

Hue—10YR

Value—3 or 4

Chroma—2

Texture—silt loam

*Bw horizon:*

Hue—10YR

Value—4 or 5

Chroma—4

Texture—silt loam

*BC horizon:*

Colors and textures similar to those of the Bw and C horizons

*C horizon:*

Hue—10YR or 2.5Y

Value—5 or 6

Chroma—2 to 4

Texture—silt loam

**Tripoli Series***Depth class:* Very deep*Drainage class:* Poorly drained*Permeability:* Moderate*Landform:* Uplands*Parent material:* Silty and loamy sediments and the underlying glacial till*Slope range:* 0 to 1 percent*Taxonomic class:* Fine-loamy, mixed, mesic Typic Haplaquolls**Typical Pedon**

Tripoli silty clay loam, 700 feet east and 400 feet north of the southwest corner of sec. 4, T. 105 N., R. 9 W.

Ap—0 to 12 inches; black (N 2/0) silty clay loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; strongly acid; clear smooth boundary.

A—12 to 16 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; black (10YR 2/1) coatings on faces of peds; strongly acid; clear smooth boundary.

- Bg1—16 to 26 inches; dark gray (5Y 4/1) silty clay loam; moderate fine angular blocky structure; friable; very dark gray (5Y 3/1) coatings on faces of peds; about 1 percent pebbles; strongly acid; clear smooth boundary.
- 2Bg2—26 to 40 inches; olive gray (5Y 5/2) loam; moderate medium prismatic structure; firm; thin very dark gray (10YR 3/1) and dark gray (10YR 4/1) coatings on faces of peds; about 1 percent pebbles; medium acid; clear smooth boundary.
- 2Bg3—40 to 53 inches; olive gray (5Y 5/2) loam; many fine distinct light olive brown (2.5Y 5/6) mottles; weak medium prismatic structure; firm; about 1 percent pebbles; common black (10YR 2/1) organic stains in channels; common thin light gray (10YR 7/1) silt coatings on faces of peds; medium acid; clear smooth boundary.
- 2BC—53 to 60 inches; gray (5Y 6/1) loam; many medium and coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; firm; about 1 percent pebbles; slightly acid.

#### Range in Characteristics

*Thickness of the mollic epipedon:* 10 to 24 inches

##### *Ap horizon:*

Hue—10YR or neutral  
Value—2  
Chroma—0 or 1  
Texture—silty clay loam

##### *A horizon:*

Hue—10YR or neutral  
Value—2 or 3  
Chroma—0 or 1  
Texture—silty clay loam or clay loam  
Content of rock fragments—0 to 10 percent

##### *Bg horizon:*

Hue—5Y or 2.5Y  
Value—4 or 5  
Chroma—1 or 2  
Texture—silty clay loam or clay loam  
Content of rock fragments—0 to 10 percent

##### *2Bg and 2BC horizons:*

Hue—10YR to 5Y  
Value—4 to 6  
Chroma—1 to 6  
Texture—loam or clay loam  
Content of rock fragments—0 to 10 percent

### Waubeek Series

*Depth class:* Very deep

*Drainage class:* Well drained and moderately well drained

*Permeability:* Moderate

*Landform:* Uplands

*Parent material:* Loess and the underlying glacial till

*Slope range:* 2 to 12 percent

*Taxonomic class:* Fine-silty, mixed, mesic Mollic Hapludalfs

#### Typical Pedon

Waubeek silt loam, 2 to 6 percent slopes, 1,580 feet south and 660 feet west of the northeast corner of sec. 18, T. 108 N., R. 10 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine granular structure; very friable; medium acid; abrupt wavy boundary.

BE—9 to 15 inches; yellowish brown (10YR 5/4) silt loam; common distinct dark grayish brown (10YR 4/2) silt coatings on faces of peds; moderate very fine subangular blocky structure; friable; slightly acid; clear wavy boundary.

Bt1—15 to 26 inches; brown (10YR 5/3) silty clay loam; moderate fine subangular blocky structure; friable; few faint dark brown (10YR 3/3) clay films on faces of peds; common light gray (10YR 7/1) silt coatings on faces of peds; strongly acid; abrupt wavy boundary.

2Bt2—26 to 31 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; very friable; many distinct dark brown (10YR 3/3) clay films on faces of peds and few very dark brown (10YR 2/2) clay films in pores; strongly acid; abrupt wavy boundary.

2Bt3—31 to 45 inches; yellowish brown (10YR 5/6) loam; moderate medium prismatic structure; firm; many dark grayish brown (10YR 4/2) clay films in pores; medium acid; clear wavy boundary.

2C—45 to 60 inches; light yellowish brown (10YR 6/4) loam; massive; firm; few faint dark grayish brown (10YR 4/2) mottles; neutral.

#### Range in Characteristics

##### *A horizon:*

Hue—10YR  
Value—3 or 4  
Chroma—1 or 2  
Texture—silt loam

##### *E horizon:*

Present in some pedons

##### *BE horizon:*

Colors and textures similar to those of the A and Bt horizons

##### *Bt horizon:*

Hue—10YR  
Value—4 or 5

Chroma—3 or 4

Texture—silt loam or silty clay loam

**2Bt and 2C horizons:**

Hue—7.5YR, 10YR, or 2.5Y

Value—5 or 6

Chroma—3 to 6

Texture—loam, sandy clay loam, or clay loam

Content of rock fragments—0 to 10 percent

Taxadjunct features: The Waubeek soils in this survey area have a lighter colored A horizon than is defined as the range for the series. This difference, however, does not alter the usefulness or behavior of the soils.

## **Waukee Series**

*Depth class:* Deep and very deep

*Drainage class:* Well drained

*Permeability:* Moderate in the upper part; very rapid to moderately slow in the lower part

*Landform:* Terraces and uplands

*Parent material:* Alluvium

*Slope range:* 0 to 6 percent

*Taxonomic class:* Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludolls

### **Typical Pedon**

Waukee loam, bedrock substratum, 0 to 2 percent slopes, 1,400 feet east and 1,700 feet north of the southwest corner of sec. 29, T. 106 N., R. 9 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

A—8 to 12 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; very dark brown (10YR 3/2) ped exteriors; weak fine subangular blocky structure; friable; slightly acid; abrupt smooth boundary.

Bw1—12 to 17 inches; dark brown (10YR 4/3) loam; weak fine angular blocky structure; friable; slightly acid; clear smooth boundary.

Bw2—17 to 24 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; few thin dark brown (10YR 4/3) coatings on faces of peds; slightly acid; clear smooth boundary.

2BC—24 to 34 inches; yellowish brown (10YR 5/4) gravelly sandy loam; weak very fine subangular blocky structure; very friable; about 20 percent pebbles; slightly acid; clear smooth boundary.

2C—34 to 42 inches; yellowish brown (10YR 5/4) gravelly loamy sand; weak very fine subangular blocky structure; loose; dark brown (10YR 3/3) clay

films on faces of peds; about 20 percent pebbles; slightly acid; abrupt wavy boundary.

3Btb—42 to 48 inches; brownish yellow (10YR 6/6) clay loam; moderate fine subangular blocky structure; firm; common distinct dark brown (10YR 3/3) clay films on faces of peds and in pores; medium acid; clear wavy boundary.

3Cr—48 to 60 inches; very pale brown (10YR 6/3), partially weathered dolomite that is shattered in the upper part and has patchy clay residuum in the widely spaced rock fissures.

### **Range in Characteristics**

*Thickness of the mollic epipedon:* 10 to 24 inches

*Depth to bedrock:* 40 to 60 inches

**Ap horizon:**

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam

Content of rock fragments—0 to 10 percent

**A horizon:**

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—loam or silt loam

Content of rock fragments—0 to 10 percent

**AB horizon:**

Present in some pedons

**Bw horizon:**

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—loam, silt loam, or sandy loam

Content of rock fragments—0 to 5 percent

**BC horizon:**

Colors and textures similar to those of the Bw and C horizons

**2C horizon:**

Hue—10YR

Value—5 or 6

Chroma—3 to 8

Texture—sand, loamy sand, coarse sand, loamy coarse sand, or the gravelly analogs of those textures

Content of rock fragments—0 to 20 percent

**3Btb horizon:**

Hue—7.5YR, 10YR, or 2.5Y

Value—3 to 6

Chroma—2 to 6

Texture—sandy loam, loam, clay loam, or clay

Content of rock fragments—0 to 5 percent



## References

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- (1) American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.
- (2) American Society for Testing and Materials. 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487.
- (3) Brown, Mark H., and Iver J. Nygard. 1941. Erosion and related land use conditions in Winona County, Minnesota. U.S. Dep. Agric., Soil Conserv. Serv. Erosion Surv. 17.
- (4) Harms, G.F. 1959. Soil survey of Wabasha County, Minnesota. U.S. Dep. Agric., Soil Conserv. Serv.
- (5) Hogberg, Rudolf K. 1972. Ground water resources in Minnesota. *In* Geology of Minnesota: A centennial volume. pp. 597-598.
- (6) Knox, James C. 1977. Human impacts of Wisconsin stream channels. *In* Annals of the Association of American Geographers. Vol. 67, no. 3, pp. 323-342.
- (7) Minnesota Agricultural Statistics Service. 1983. Minnesota agricultural statistics. Minn. Dep. Agric. and U.S. Dep. Agric.
- (8) Simon, Marvin J. 1965. Pioneers forever.
- (9) Thiel, George A. 1956. Geology and underground waters of southern Minnesota. Minn. Geol. Surv. Bull. 31.
- (10) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18.
- (11) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210.
- (12) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436.
- (13) United States Department of Agriculture. 1984 (rev.). Procedures for collecting soil samples and methods of analysis for soil survey. Soil Surv. Invest. Rep. 1.
- (14) Winona County Historical Society. 1983. History of Winona County.

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# Glossary

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**ABC soil.** A soil having an A, a B, and a C horizon.

**AC soil.** A soil having only an A and a C horizon.

Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

**Aeration, soil.** The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

**Aggregate, soil.** Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

**Alluvium.** Material, such as sand, silt, or clay, deposited on land by streams.

**Area reclaim** (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

**Association, soil.** A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

**Available water capacity (available moisture capacity).** The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low .....	0 to 3
Low .....	3 to 6
Moderate .....	6 to 9
High.....	9 to 12
Very high .....	more than 12

**Basal till.** Compact glacial till deposited beneath the ice.

**Base saturation.** The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Bottom land.** The normal flood plain of a stream, subject to flooding.

**Boulders.** Rock fragments larger than 2 feet (60 centimeters) in diameter.

**Calcareous soil.** A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

**Capillary water.** Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

**Catena.** A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

**Cation.** An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

**Cation-exchange capacity.** The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

**Chiseling.** Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil texture class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Clay film.** A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

**Coarse fragments.** If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in



diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

**Coarse textured soil.** Sand or loamy sand.

**Cobblestone (or cobble).** A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

**Colluvium.** Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

**Complex slope.** Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

**Complex, soil.** A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

**Concretions.** Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

**Congeliturbate.** Soil material disturbed by frost action.

**Conservation tillage.** A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

*Loose.*—Noncoherent when dry or moist; does not hold together in a mass.

*Friable.*—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

*Sticky.*—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

*Hard.*—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

*Soft.*—When dry, breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard; little affected by moistening.

**Contour stripcropping.** Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

**Control section.** The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

**Coprogenous earth (sedimentary peat).** Fecal material deposited in water by aquatic organisms.

**Cover crop.** A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

**Deferred grazing.** Postponing grazing or resting grazing land for a prescribed period.

**Diversion (or diversion terrace).** A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

**Drainage class (natural).** Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

*Excessively drained.*—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

*Somewhat excessively drained.*—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

*Well drained.*—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

*Moderately well drained.*—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly

below the solum or periodically receive high rainfall, or both.

*Somewhat poorly drained.*—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

*Poorly drained.*—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

*Very poorly drained.*—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

**Drainage, surface.** Runoff, or surface flow of water, from an area.

**Drumlin.** A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

**Eluviation.** The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

**Eolian soil material.** Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

**Erosion.** The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

*Erosion* (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as

flood plains and coastal plains. Synonym: natural erosion.

*Erosion* (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

**Erosion pavement.** A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

**Fertility, soil.** The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

**Fibric soil material (peat).** The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

**Field moisture capacity.** The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

**Fine textured soil.** Sandy clay, silty clay, or clay.

**First bottom.** The normal flood plain of a stream, subject to frequent or occasional flooding.

**Flagstone.** A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

**Flood plain.** A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

**Foot slope.** The inclined surface at the base of a hill.

**Forb.** Any herbaceous plant not a grass or a sedge.

**Genesis, soil.** The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

**Glacial drift** (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

**Glacial outwash** (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

**Glacial till** (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

**Glaciofluvial deposits** (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits



are stratified and occur as kames, eskers, deltas, and outwash plains.

**Glaciolacustrine deposits.** Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

**Gleyed soil.** Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

**Gravel.** Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

**Gravelly soil material.** Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

**Green manure crop** (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

**Ground water** (geology). Water filling all the unblocked pores of the material below the water table.

**Gully.** A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

**Hardpan.** A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

**Hemic soil material (mucky peat).** Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

*O horizon.*—An organic layer of fresh and decaying plant residue.

*A horizon.*—The mineral horizon at or near the surface in which an accumulation of humified

organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

*E horizon.*—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

*B horizon.*—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

*C horizon.*—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

*Cr horizon.*—Soft, consolidated bedrock beneath the soil.

*R layer.*—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

**Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.

**Hydrologic soil groups.** Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

**Illuviation.** The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

**Impervious soil.** A soil through which water, air, or



roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

**Infiltration.** The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

**Infiltration capacity.** The maximum rate at which water can infiltrate into a soil under a given set of conditions.

**Infiltration rate.** The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

**Intake rate.** The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2 .....	very low
0.2 to 0.4 .....	low
0.4 to 0.75 .....	moderately low
0.75 to 1.25 .....	moderate
1.25 to 1.75 .....	moderately high
1.75 to 2.5 .....	high
More than 2.5 .....	very high

**Irrigation.** Application of water to soils to assist in production of crops. Methods of irrigation are:

*Basin.*—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

*Border.*—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

*Controlled flooding.*—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

*Corrugation.*—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

*Drip (or trickle).*—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

*Furrow.*—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

*Sprinkler.*—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

*Subirrigation.*—Water is applied in open ditches or

tile lines until the water table is raised enough to wet the soil.

*Wild flooding.*—Water, released at high points, is allowed to flow onto an area without controlled distribution.

**Kame** (geology). An irregular, short ridge or hill of stratified glacial drift.

**Karst** (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

**Lacustrine deposit** (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

**Large stones** (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

**Leaching.** The removal of soluble material from soil or other material by percolating water.

**Liquid limit.** The moisture content at which the soil passes from a plastic to a liquid state.

**Loam.** Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

**Loess.** Fine grained material, dominantly of silt-sized particles, deposited by the wind.

**Low strength.** The soil is not strong enough to support loads.

**Medium textured soil.** Very fine sandy loam, loam, silt loam, or silt.

**Metamorphic rock.** Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

**Mineral soil.** Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

**Minimum tillage.** Only the tillage essential to crop production and prevention of soil damage.

**Miscellaneous area.** An area that has little or no natural soil and supports little or no vegetation.

**Moderately coarse textured soil.** Coarse sandy loam, sandy loam, or fine sandy loam.

**Moderately fine textured soil.** Clay loam, sandy clay loam, or silty clay loam.

**Moraine** (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

**Morphology, soil.** The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

**Mottling, soil.** Irregular spots of different colors that

vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

**Muck.** Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

**Munsell notation.** A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

**Neutral soil.** A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

**Nutrient, plant.** Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

**Organic matter.** Plant and animal residue in the soil in various stages of decomposition.

**Outwash plain.** A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

**Parent material.** The unconsolidated organic and mineral material in which soil forms.

**Peat.** Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

**Ped.** An individual natural soil aggregate, such as a granule, a prism, or a block.

**Pedon.** The smallest volume that can be called “a soil.” A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

**Percolation.** The downward movement of water through the soil.

**Percs slowly** (in tables). The slow movement of water through the soil, adversely affecting the specified use.

**Permeability.** The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow .....	less than 0.06 inch
Slow .....	0.06 to 0.2 inch
Moderately slow .....	0.2 to 0.6 inch
Moderate .....	0.6 inch to 2.0 inches
Moderately rapid .....	2.0 to 6.0 inches
Rapid .....	6.0 to 20 inches
Very rapid .....	more than 20 inches

**Phase, soil.** A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

**pH value.** A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

**Plasticity index.** The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

**Plastic limit.** The moisture content at which a soil changes from semisolid to plastic.

**Ponding.** Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

**Poorly graded.** Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

**Productivity, soil.** The capability of a soil for producing a specified plant or sequence of plants under specific management.

**Profile, soil.** A vertical section of the soil extending through all its horizons and into the parent material.

**Reaction, soil.** A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid .....	below 4.5
Very strongly acid .....	4.5 to 5.0
Strongly acid .....	5.1 to 5.5
Medium acid .....	5.6 to 6.0
Slightly acid .....	6.1 to 6.5
Neutral .....	6.6 to 7.3
Mildly alkaline .....	7.4 to 7.8
Moderately alkaline .....	7.9 to 8.4
Strongly alkaline .....	8.5 to 9.0
Very strongly alkaline .....	9.1 and higher

**Rill.** A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

**Rock fragments.** Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.



**Root zone.** The part of the soil that can be penetrated by plant roots.

**Runoff.** The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

**Sand.** As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

**Sapric soil material (muck).** The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

**Sedimentary rock.** Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

**Sequum.** A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

**Series, soil.** A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

**Sheet erosion.** The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

**Shrink-swell.** The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

**Silica.** A combination of silicon and oxygen. The mineral form is called quartz.

**Silica-sesquioxide ratio.** The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

**Silt.** As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

**Similar soils.** Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

**Site index.** A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

**Slickensides.** Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

**Slope.** The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

The slope classes used in this survey are:

Nearly level.....	0 to 2 percent
Gently sloping .....	2 to 6 percent
Sloping.....	6 to 12 percent
Moderately steep .....	12 to 20 percent
Steep .....	20 to 25 percent
Very steep .....	25 to 70 percent

**Slope** (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

**Small stones** (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

**Soil.** A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

**Soil separates.** Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand.....	2.0 to 1.0
Coarse sand .....	1.0 to 0.5
Medium sand .....	0.5 to 0.25
Fine sand .....	0.25 to 0.10
Very fine sand .....	0.10 to 0.05
Silt .....	0.05 to 0.002
Clay .....	less than 0.002

**Solum.** The upper part of a soil profile, above the C horizon, in which the processes of soil formation



are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

**Stone line.** A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

**Stones.** Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

**Stony.** Refers to a soil containing stones in numbers that interfere with or prevent tillage.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

**Stubble mulch.** Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

**Subsoil.** Technically, the B horizon; roughly, the part of the solum below plow depth.

**Substratum.** The part of the soil below the solum.

**Subsurface layer.** Any surface soil horizon (A, E, AB, or EB) below the surface layer.

**Surface layer.** The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the “plow layer,” or the “Ap horizon.”

**Surface soil.** The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

**Taxadjuncts.** Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of

consequence in interpreting their use and behavior.

**Terminal moraine.** A belt of thick glacial drift that generally marks the termination of important glacial advances.

**Terrace.** An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

**Terrace (geologic).** An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying “coarse,” “fine,” or “very fine.”

**Thin layer (in tables).** Otherwise suitable soil material that is too thin for the specified use.

**Till plain.** An extensive area of nearly level to undulating soils underlain by glacial till.

**Tilth, soil.** The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

**Toe slope.** The outermost inclined surface at the base of a hill; part of a foot slope.

**Topsoil.** The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

**Trace elements.** Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

**Upland (geology).** Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

**Valley fill.** In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

**Variant, soil.** A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

**Variegation.** Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

**Varve.** A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

**Weathering.** All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

**Well graded.** Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

**Wilting point (or permanent wilting point).** The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

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# Tables

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TABLE 1.--TEMPERATURE AND PRECIPITATION  
(Recorded in the period 1951-80 at Winona, Minnesota)

	Temperature						Precipitation					
Month				2 years in 10 will have--		Average		2 years in 10 will have--		Average		
	Average daily maximum	Average daily minimum	Average daily	Maximum temperature higher than--	Minimum temperature lower than--	number of growing degree days*	Average	Less than--	More than--	number of days with 0.10 inch or more	Average snowfall	
	° F	° F	° F	° F	° F	Units	In	In	In		In	
January-----	23.4	2.0	12.7	48	-27	0	1.14	0.35	1.78	4	11.4	
February----	29.9	6.6	18.3	53	-20	0	.93	.22	1.49	3	9.2	
March-----	40.5	18.6	29.6	70	-10	8	2.07	.94	3.03	5	11.5	
April-----	57.4	34.4	45.9	87	15	64	2.89	1.68	3.96	7	2.7	
May-----	70.6	46.4	58.5	92	28	296	4.17	2.67	5.53	8	.0	
June-----	79.6	56.1	67.9	97	41	537	4.62	2.63	6.38	8	.0	
July-----	84.5	61.0	72.8	99	48	707	4.25	2.36	5.91	7	.0	
August-----	82.1	58.3	70.2	96	43	626	4.25	2.10	6.11	7	.0	
September---	73.3	48.7	61.0	93	32	330	3.44	1.20	5.29	7	.0	
October-----	62.1	38.4	50.3	88	20	140	2.15	.78	3.28	5	.1	
November----	44.9	25.5	35.2	70	1	0	1.63	.50	2.54	4	4.0	
December----	29.8	11.3	20.6	57	-19	0	1.17	.61	1.65	4	8.8	
Yearly:												
Average---	56.5	33.9	45.3	---	---	---	---	---	---	---	---	
Extreme---	---	---	---	99	-28	---	---	---	---	---	---	
Total-----	---	---	---	---	---	2,708	32.71	26.24	38.84	69	47.7	

\* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL  
(Recorded in the period 1951-80 at Winona, Minnesota)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 21	May 4	May 17
2 years in 10 later than--	Apr. 17	Apr. 30	May 11
5 years in 10 later than--	Apr. 9	Apr. 21	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 15	Oct. 4	Sept. 22
2 years in 10 earlier than--	Oct. 20	Oct. 9	Sept. 27
5 years in 10 earlier than--	Oct. 29	Oct. 19	Oct. 7

TABLE 3.--GROWING SEASON  
(Recorded in the period 1951-80 at Winona,  
Minnesota)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	183	160	136
8 years in 10	190	167	144
5 years in 10	203	179	158
2 years in 10	216	192	173
1 year in 10	222	199	180



TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
11B	Sogn silt loam, 1 to 6 percent slopes-----	530	0.1
11D	Sogn silt loam, rocky, 6 to 30 percent slopes-----	1,750	0.4
19	Chaseburg silt loam-----	5,580	1.4
24	Kasson silt loam-----	270	0.1
25	Becker fine sandy loam-----	370	0.1
79B	Billett fine sandy loam, 1 to 6 percent slopes-----	520	0.1
81B	Boone loamy fine sand, 2 to 6 percent slopes-----	380	0.1
81C	Boone loamy fine sand, 6 to 15 percent slopes-----	300	0.1
95C	Dunbarton silt loam, rocky, 4 to 12 percent slopes-----	1,530	0.4
99B	Racine silt loam, 2 to 6 percent slopes-----	1,150	0.3
99C	Racine silt loam, 6 to 12 percent slopes-----	480	0.1
103A	Seaton silt loam, 1 to 3 percent slopes-----	1,600	0.4
103B	Seaton silt loam, 3 to 6 percent slopes-----	35,000	8.6
103C	Seaton silt loam, 6 to 12 percent slopes-----	37,235	9.2
103D	Seaton silt loam, 12 to 20 percent slopes-----	4,980	1.2
173F	Frontenac loam, 30 to 40 percent slopes-----	810	0.2
174D	Gale silt loam, 12 to 20 percent slopes-----	1,380	0.3
176	Garwin silt loam-----	900	0.2
194	Huntsville silt loam-----	1,830	0.5
198C	Rollingstone silt loam, 3 to 12 percent slopes-----	2,870	0.7
198D	Rollingstone silt loam, 12 to 20 percent slopes-----	4,830	1.2
215B	Southridge silt loam, 2 to 6 percent slopes-----	480	0.1
215C	Southridge silt loam, 6 to 12 percent slopes-----	3,210	0.8
215D	Southridge silt loam, 12 to 20 percent slopes-----	3,680	0.9
262B	Medary silt loam, 1 to 6 percent slopes-----	510	0.1
271	Minneiska fine sandy loam, channeled-----	470	0.1
283B	Plainfield sand, 1 to 6 percent slopes-----	520	0.1
283C	Plainfield sand, 6 to 12 percent slopes-----	490	0.1
283D	Plainfield sand, 12 to 25 percent slopes-----	550	0.1
283F	Plainfield sand, 25 to 50 percent slopes-----	2,400	0.6
285A	Port Byron silt loam, 1 to 3 percent slopes-----	4,600	1.1
285B	Port Byron silt loam, 3 to 6 percent slopes-----	11,000	2.7
285C	Port Byron silt loam, 6 to 12 percent slopes-----	7,750	1.9
299B	Rockton silt loam, 1 to 6 percent slopes-----	2,030	0.5
301A	Lindstrom silt loam, 1 to 3 percent slopes-----	5,560	1.4
301C	Lindstrom silt loam, 6 to 12 percent slopes-----	630	0.2
301D	Lindstrom silt loam, 12 to 20 percent slopes-----	630	0.2
322C2	Timula silt loam, 6 to 12 percent slopes, eroded-----	470	0.1
322D2	Timula silt loam, 12 to 20 percent slopes, eroded-----	370	0.1
322E2	Timula silt loam, 20 to 40 percent slopes, eroded-----	800	0.2
322F	Timula silt loam, 40 to 60 percent slopes-----	2,550	0.6
331	Tripoli silty clay loam-----	330	0.1
369B	Waubee silt loam, 2 to 6 percent slopes-----	530	0.1
369C	Waubee silt loam, 6 to 12 percent slopes-----	510	0.1
388C	Seaton silt loam, valleys, 6 to 12 percent slopes-----	1,120	0.3
388D	Seaton silt loam, valleys, 12 to 20 percent slopes-----	3,630	0.9
388E	Seaton silt loam, valleys, 20 to 30 percent slopes-----	9,460	2.3
401B	Mt. Carroll silt loam, 3 to 6 percent slopes-----	23,790	5.9
401C	Mt. Carroll silt loam, 6 to 12 percent slopes-----	4,980	1.2
401D	Mt. Carroll silt loam, 12 to 20 percent slopes-----	1,140	0.3
455A	Festina silt loam, 0 to 2 percent slopes-----	1,330	0.3
455B	Festina silt loam, 2 to 6 percent slopes-----	3,830	0.9
457E	Lacrescent channery silt loam, 20 to 45 percent slopes-----	910	0.2
457G	Lacrescent silt loam, rocky, 45 to 70 percent slopes-----	45,250	11.3
468	Otter silt loam-----	1,250	0.3
474B	Haverhill mucky silty clay loam, 1 to 8 percent slopes-----	1,130	0.3
476B	Frankville silt loam, 2 to 6 percent slopes-----	580	0.1
476C	Frankville silt loam, 6 to 12 percent slopes-----	810	0.2
476D	Frankville silt loam, 12 to 18 percent slopes-----	690	0.2
477	Littleton silt loam-----	1,830	0.5
483	Waukee loam-----	710	0.2
484D	Eyota fine sandy loam, 12 to 20 percent slopes-----	240	0.1
488G	Brodale cobbly loam, rocky, 45 to 70 percent slopes-----	6,990	1.7
492B	Nasset silt loam, 3 to 6 percent slopes-----	370	0.1
492C	Nasset silt loam, 6 to 12 percent slopes-----	340	0.1

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
493B	Oronoco fine sandy loam, 3 to 8 percent slopes-----	500	0.1
501B	NewGlarus silt loam, 3 to 6 percent slopes-----	810	0.2
501C	NewGlarus silt loam, 6 to 12 percent slopes-----	5,310	1.3
501D	NewGlarus silt loam, 12 to 20 percent slopes-----	3,780	0.9
501E	NewGlarus silt loam, rocky, 12 to 30 percent slopes-----	2,230	0.6
522	Boots muck-----	340	0.1
576	Newalbin silt loam-----	2,730	0.7
577	Newalbin silt loam, channeled-----	3,830	0.9
578	Newalbin silt loam, very wet-----	670	0.2
580B	Blackhammer-Southridge silt loams, 2 to 6 percent slopes-----	4,230	1.0
580C	Blackhammer-Southridge silt loams, 6 to 12 percent slopes-----	6,840	1.7
580D	Blackhammer-Southridge silt loams, 12 to 20 percent slopes-----	1,380	0.3
584F	Lamoille-Dorerton silt loams, 30 to 45 percent slopes-----	16,430	4.1
586C	Nodine-Rollingstone silt loams, 4 to 12 percent slopes-----	1,100	0.3
586D	Nodine-Rollingstone silt loams, 12 to 20 percent slopes-----	1,330	0.3
587B	Palsgrove silt loam, 2 to 6 percent slopes-----	470	0.1
587C	Palsgrove silt loam, 6 to 12 percent slopes-----	3,105	0.8
587D	Palsgrove silt loam, 12 to 20 percent slopes-----	3,630	0.9
592E	Lamoille-Elbaville silt loams, 20 to 30 percent slopes-----	12,330	3.0
598B	Beavercreek silt loam, 1 to 8 percent slopes, stony-----	7,290	1.8
599E	Norden silt loam, 15 to 30 percent slopes-----	1,000	0.2
599F	Norden silt loam, 30 to 45 percent slopes-----	800	0.2
604	Huntsville-Beavercreek complex, channeled-----	5,230	1.3
606	Shiloh silt loam, ponded-----	1,650	0.4
815F	Elbaville-Seaton silt loams, 30 to 45 percent slopes-----	12,570	3.1
826B	Gale-Blackhammer silt loams, 2 to 6 percent slopes-----	250	0.1
826C	Gale-Blackhammer silt loams, 6 to 12 percent slopes-----	1,120	0.3
829C	Seaton-Gale silt loams, 6 to 12 percent slopes-----	1,350	0.3
830D	Eleva-Seaton complex, 12 to 30 percent slopes-----	2,350	0.6
831F	Spinks-Boone-Sogn complex, rocky, 15 to 60 percent slopes-----	890	0.2
832F	Lacrescent-Rock outcrop complex, 30 to 45 percent slopes-----	1,110	0.3
832G	Lacrescent-Rock outcrop complex, 45 to 70 percent slopes-----	1,880	0.5
839	Urban land-Minneopa complex-----	540	0.1
840	Urban land-Finchford complex-----	2,230	0.6
898F	Bellechester-Brodale complex, rocky, 15 to 60 percent slopes-----	700	0.2
1002	Fluvaquents, channeled-----	400	0.1
1010	Riverwash-----	370	0.1
1013	Pits, quarries-----	540	0.1
1015	Psamments, fill-----	1,150	0.3
1016	Udorthents, loamy-----	230	0.1
1029	Pits, gravel-----	140	*
1822B	Abscota Variant sand, 1 to 6 percent slopes-----	380	0.1
1830	Eitzen silt loam-----	1,230	0.3
1857	Eitzen silt loam, channeled-----	3,660	0.9
1860	Comfrey silt loam, channeled-----	1,330	0.3
1861	Chaseburg silt loam, channeled-----	1,170	0.3
1893B	Beavercreek Variant loam, 1 to 6 percent slopes-----	850	0.2
1936	Hoopeston sandy loam, bedrock substratum-----	390	0.1
1937	Lawler loam, bedrock substratum-----	540	0.1
1951A	Flagler sandy loam, bedrock substratum, 0 to 2 percent slopes-----	890	0.2
1951B	Flagler sandy loam, bedrock substratum, 2 to 6 percent slopes-----	810	0.2
1952B	Keltner silt loam, 3 to 6 percent slopes-----	590	0.1
1952C	Keltner silt loam, 6 to 12 percent slopes-----	350	0.1
1953	Marshan silt loam, loamy substratum-----	390	0.1
1954B	Spinks loamy fine sand, bedrock substratum, 1 to 6 percent slopes-----	860	0.2
1954C	Spinks loamy fine sand, bedrock substratum, 6 to 15 percent slopes-----	470	0.1
1955A	Waukee loam, bedrock substratum, 0 to 2 percent slopes-----	1,180	0.3
1955B	Waukee loam, bedrock substratum, 2 to 6 percent slopes-----	1,050	0.3
1960B	Haverhill Variant clay loam, 1 to 8 percent slopes-----	630	0.2
1990	Otter mucky silt loam, very wet-----	330	0.1
	Water-----	8,500	2.1
	Total-----	405,180	100.0

\* Less than 0.05 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
19	Chaseburg silt loam
24	Kasson silt loam
25	Becker fine sandy loam
79B	Billett fine sandy loam, 1 to 6 percent slopes
99B	Racine silt loam, 2 to 6 percent slopes
103A	Seaton silt loam, 1 to 3 percent slopes
103B	Seaton silt loam, 3 to 6 percent slopes
176	Garwin silt loam (where drained)
194	Huntsville silt loam
215B	Southridge silt loam, 2 to 6 percent slopes
262B	Medary silt loam, 1 to 6 percent slopes
285A	Port Byron silt loam, 1 to 3 percent slopes
285B	Port Byron silt loam, 3 to 6 percent slopes
299B	Rockton silt loam, 1 to 6 percent slopes
301A	Lindstrom silt loam, 1 to 3 percent slopes
331	Tripoli silty clay loam (where drained)
369B	Waubek silt loam, 2 to 6 percent slopes
401B	Mt. Carroll silt loam, 3 to 6 percent slopes
455A	Festina silt loam, 0 to 2 percent slopes
455B	Festina silt loam, 2 to 6 percent slopes
468	Otter silt loam (where drained)
476B	Frankville silt loam, 2 to 6 percent slopes
477	Littleton silt loam
483	Waukee loam
492B	Nasset silt loam, 3 to 6 percent slopes
493B	Oronoco fine sandy loam, 3 to 8 percent slopes
501B	NewGlarus silt loam, 3 to 6 percent slopes
576	Newalbin silt loam (where drained)
580B	Blackhammer-Southridge silt loams, 2 to 6 percent slopes
587B	Palsgrove silt loam, 2 to 6 percent slopes
826B	Gale-Blackhammer silt loams, 2 to 6 percent slopes
1830	Eitzen silt loam
1936	Hoopeston sandy loam, bedrock substratum
1937	Lawler loam, bedrock substratum
1952B	Keltner silt loam, 3 to 6 percent slopes
1953	Marshan silt loam, loamy substratum (where drained)
1955A	Waukee loam, bedrock substratum, 0 to 2 percent slopes
1955B	Waukee loam, bedrock substratum, 2 to 6 percent slopes



TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Brome-grass- alfalfa	Kentucky bluegrass
		Bu	Bu	Tons	Bu	Tons	AUM*	AUM*
11B----- Sogn	VIIs	---	---	---	---	2.5	3.5	2.2
11D----- Sogn	VIIIs	---	---	---	---	---	---	2.0
19----- Chaseburg	I	140	40	22.0	80	5.5	8.3	3.0
24----- Kasson	IIe	120	36	18.5	70	4.3	6.3	2.8
25----- Becker	IIIs	95	29	14.6	70	4.0	5.8	2.4
79B----- Billett	IIIIs	90	25	13.0	70	2.5	5.3	2.2
81B----- Boone	IVs	50	14	7.2	45	2.0	3.0	1.2
81C----- Boone	VIIs	40	18	6.0	40	1.8	2.7	1.0
95C----- Dunbarton	IVe	---	---	---	---	---	---	2.7
99B----- Racine	IIe	130	38	20.0	80	5.2	7.3	2.6
99C----- Racine	IIIe	120	35	18.5	75	4.2	7.0	2.4
103A, 103B----- Seaton	IIe	150	40	24.0	85	6.0	8.6	2.8
103C----- Seaton	IIIe	140	37	22.0	80	5.7	8.4	2.6
103D----- Seaton	IVe	130	30	20.0	59	5.4	7.9	2.4
173F----- Frontenac	VIIe	---	---	---	---	---	---	---
174D----- Gale	IVe	90	---	---	65	3.6	5.4	2.2
176----- Garwin	IIw	155	47	24.0	75	5.0	7.3	3.6
194----- Huntsville	I	150	45	23.0	75	5.8	8.6	3.2
198C----- Rollingstone	IIIe	100	---	15.0	65	3.7	5.4	2.3

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Bromegrass- alfalfa	Kentucky bluegrass
		Bu	Bu	Tons	Bu	Tons	AUM*	AUM*
198D----- Rollingstone	IVe	90	---	13.0	60	3.4	5.1	2.0
215B----- Southridge	IIe	125	33	19.0	85	5.2	7.6	2.8
215C----- Southridge	IIIe	115	31	17.0	80	5.0	7.3	2.6
215D----- Southridge	IVe	105	---	16.0	75	4.6	6.8	2.4
262B----- Medary	IIe	135	36	20.0	75	5.4	8.0	2.8
271----- Minneiska	Vw	---	---	---	---	---	---	1.8
283B----- Plainfield	IVs	50	12	6.0	45	2.1	3.2	1.2
283C----- Plainfield	VIIs	---	---	---	---	---	3.0	1.0
283D----- Plainfield	VIIIs	---	---	---	---	---	---	0.8
283F----- Plainfield	VIIIs	---	---	---	---	---	---	0.6
285A, 285B----- Port Byron	IIe	160	48	25.0	85	6.0	8.7	3.2
285C----- Port Byron	IIIe	150	45	23.0	80	5.7	8.4	3.0
299B----- Rockton	IIe	100	30	15.0	75	3.9	5.7	2.8
301A----- Lindstrom	IIe	165	50	25.0	85	6.0	8.8	3.3
301C----- Lindstrom	IIIe	155	47	24.0	80	5.7	8.4	3.2
301D----- Lindstrom	IVe	140	42	21.0	75	5.4	8.0	3.0
322C2----- Timula	IIIe	140	37	21.0	80	5.7	8.4	2.8
322D2----- Timula	IVe	115	---	18.0	70	5.4	8.0	2.4
322E2----- Timula	VIIe	---	---	---	---	---	---	1.6
322F----- Timula	VIIe	---	---	---	---	---	---	1.2

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Bromegrass- alfalfa	Kentucky bluegrass
		Bu	Bu	Tons	Bu	Tons	AUM*	AUM*
331----- Tripoli	IIw	140	42	22.0	80	5.0	7.3	3.2
369B----- Waubee	IIe	145	39	22.0	85	5.7	8.4	2.8
369C----- Waubee	IIIe	135	36	20.0	80	5.6	8.2	2.6
388C----- Seaton	IIIe	140	37	21.0	80	5.7	8.4	2.6
388D----- Seaton	IVe	130	30	20.0	75	5.4	7.9	2.4
388E----- Seaton	VIe	---	---	---	---	---	6.1	2.2
401B----- Mt. Carroll	IIe	155	45	24.0	85	6.0	8.7	3.0
401C----- Mt. Carroll	IIIe	145	42	22.0	80	5.7	8.4	2.8
401D----- Mt. Carroll	IVe	135	---	21.0	75	5.4	7.9	2.6
455A----- Festina	I	150	42	23.0	85	6.0	8.8	3.0
455B----- Festina	IIe	145	40	22.0	82	6.0	8.8	2.9
457E----- Lacrescent	VIe	---	---	---	---	---	---	1.4
457G----- Lacrescent	VIIe	---	---	---	---	---	---	---
468----- Otter	IIw	140	42	23.0	75	4.5	6.5	3.6
474B----- Haverhill	VIw	---	---	---	---	---	---	---
476B----- Frankville	IIe	110	32	17.0	70	4.3	6.4	2.8
476C----- Frankville	IIIe	100	---	15.0	70	3.9	5.6	2.6
476D----- Frankville	VIe	---	---	---	---	---	5.3	2.4
477----- Littleton	I	165	50	25.0	85	6.0	8.7	3.5
483----- Wauke	IIIs	125	37	19.0	80	4.3	6.5	2.8

See footnotes at end of table.



TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Brome-grass- alfalfa	Kentucky bluegrass
		Bu	Bu	Tons	Bu	Tons	AUM*	AUM*
484D----- Eyota	IVe	120	36	18.0	80	4.8	7.0	2.3
488G----- Brodale	VIIIs	---	---	---	---	---	---	0.6
492B----- Nasset	IIe	135	39	20.0	85	5.4	8.1	3.0
492C----- Nasset	IIIe	125	36	19.0	80	5.2	7.8	2.8
493B----- Oronoco	IIe	125	36	19.0	80	5.0	7.3	2.6
501B----- NewGlarus	IIe	110	29	17.0	75	4.3	6.4	2.8
501C----- NewGlarus	IIIe	100	---	15.0	70	3.9	6.8	2.6
501D----- NewGlarus	IVe	90	---	---	65	3.7	5.4	2.4
501E----- NewGlarus	VIe	---	---	---	---	---	---	1.8
522----- Boots	VIw	---	---	---	---	---	---	---
576----- Newalbin	IIw	130	40	20.0	70	5.0	7.3	3.2
577----- Newalbin	Vw	---	---	---	---	---	---	3.0
578----- Newalbin	VIIw	---	---	---	---	---	---	---
580B----- Blackhammer- Southridge	IIe	125	33	19.0	80	5.2	7.5	2.8
580C----- Blackhammer- Southridge	IIIe	130	30	17.0	70	5.0	7.3	2.6
580D----- Blackhammer- Southridge	IVe	105	---	15.0	65	4.6	6.7	2.4
584F----- Lamoille- Dorerton	VIIe	---	---	---	---	---	---	---
586C----- Nodine- Rollingstone	IIIe	100	---	15.0	65	3.7	5.4	2.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Brome-grass- alfalfa	Kentucky bluegrass
		Bu	Bu	Tons	Bu	Tons	AUM*	AUM*
586D----- Nodine- Rollingstone	IVe	90	---	14.0	60	3.5	5.3	1.8
587B----- Palsgrove	IIe	135	36	20.0	85	5.4	8.1	2.8
587C----- Palsgrove	IIIe	130	34	20.0	80	5.2	7.6	2.6
587D----- Palsgrove	IVe	120	---	18.0	75	4.9	7.3	2.4
592E----- Lamoille----- Elbaville-----	VIe VIIe	---	---	---	---	---	4.5	1.8
598B----- Beavercreek	VIIs	---	---	---	---	---	---	1.2
599E----- Norden	VIe	---	---	---	---	---	5.3	2.0
599F----- Norden	VIIe	---	---	---	---	---	---	---
604----- Huntsville----- Beavercreek----	IIw VIIs	---	---	---	---	---	---	2.2
606----- Shiloh	VIIIw	---	---	---	---	---	---	---
815F----- Elbaville- Seaton	VIIe	---	---	---	---	---	---	---
826B----- Gale- Blackhammer	IIe	110	29	17.0	76	4.3	6.3	2.8
826C----- Gale- Blackhammer	IIIe	100	---	15.0	75	4.0	5.8	2.6
829C----- Seaton-Gale	IIIe	135	36	20.0	80	5.2	7.6	2.6
830D----- Eleva-Seaton	VIe	---	---	---	---	---	---	2.2
831F----- Spinks----- Boone----- Sogn-----	VIe VIIIs VIIIs	---	---	---	---	---	---	1.4

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Bromegrass- alfalfa	Kentucky bluegrass
		<u>Bu</u>	<u>Bu</u>	<u>Tons</u>	<u>Bu</u>	<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>
832F: Lacrescent----- Rock outcrop.	VIIe	---	---	---	---	---	---	---
832G: Lacrescent----- Rock outcrop.	VIIe	---	---	---	---	---	---	---
839**. Urban land- Minneopa								
840**. Urban land- Finchford								
898F----- Bellechester- Brodale	VIIIs	---	---	---	---	---	---	0.7
1002. Fluvaquents								
1010**. Riverwash								
1013**. Pits, quarries								
1015. Psammments								
1016. Udorthents								
1029**. Pits, gravel								
1822B----- Abscota Variant	IIIs	70	20	10.0	55	3.0	4.5	1.6
1830----- Eitzen	IIw	140	44	21.0	70	5.3	7.9	3.0
1857----- Eitzen	Vw	---	---	---	---	---	---	3.0
1860----- Comfrey	Vw	---	---	---	---	---	---	---
1861----- Chaseburg	Vw	---	---	---	---	5.5	---	2.8
1893B----- Beavercreek Variant	IIIe	110	32	17.0	70	4.1	5.9	2.4

See footnotes at end of table.



TABLE 6.--LAND CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Corn silage	Oats	Grass- legume hay	Bromegrass- alfalfa	Kentucky bluegrass
		Bu	Bu	Tons	Bu	Tons	AUM*	AUM*
1936----- Hoopeston	IIe	95	28	15.0	70	3.0	4.5	2.6
1937----- Lawler	IIs	125	38	19.0	80	4.6	6.0	3.0
1951A----- Flagler	IIIs	95	29	14.5	70	3.7	5.5	2.4
1951B----- Flagler	IIIe	90	27	14.0	70	3.5	5.2	2.2
1952B----- Keltner	IIe	140	12	21.0	75	5.2	7.6	3.0
1952C----- Keltner	IIIe	130	40	20.0	75	5.0	7.3	2.8
1953----- Marshan	IIw	130	39	20.0	70	4.6	6.8	3.2
1954B----- Spinks	IIIe	80	22	12.0	60	3.0	4.5	1.7
1954C----- Spinks	IIIe	---	---	---	---	---	---	1.3
1955A----- Waukee	IIs	125	38	19.0	85	4.8	7.0	2.8
1955B----- Waukee	IIe	115	35	17.0	80	4.6	6.8	2.7
1960B----- Haverhill Variant	IVw	85	25	13.0	45	3.0	4.4	2.2
1990----- Otter	VIw	---	---	---	---	---	---	---

\* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

\*\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Common trees	Site index	Volume*	
19----- Chaseburg	4A	Slight	Slight	Slight	Slight	Northern red oak---- Eastern cottonwood-- Bigtooth aspen----- Silver maple----- Boxelder----- Slippery elm----- White ash-----	65 --- --- --- --- --- ---	59 --- --- --- --- --- ---	Sugar maple, black walnut, white spruce, white ash.
24----- Kasson	5A	Slight	Slight	Slight	Slight	American basswood--- Eastern cottonwood-- Boxelder----- White oak----- Northern red oak----	70 85 --- 70 70	66 91 --- 66 66	Black walnut, white ash, northern red oak, white oak, sugar maple, eastern white pine.
79B----- Billett	4A	Slight	Slight	Slight	Slight	Northern red oak---- Bur oak----- Black oak----- White oak----- Black cherry----- Shagbark hickory----	60 --- --- --- --- ---	51 --- --- --- --- ---	Eastern white pine, red pine, Scotch pine.
81B, 81C----- Boone	2D	Slight	Slight	Moderate	Moderate	Black oak----- Northern red oak---- Bur oak-----	44 45 ---	29 27 ---	Eastern white pine, red pine, Scotch pine.
95C----- Dunbarton	4D	Slight	Slight	Moderate	Severe	Northern red oak---- Black oak----- White oak----- Shagbark hickory---- Bur oak-----	61 --- --- --- ---	53 --- --- --- ---	Eastern white pine, red pine.
99B, 99C----- Racine	5A	Slight	Slight	Slight	Slight	American basswood--- Northern red oak---- Sugar maple----- White oak-----	70 65 60 ---	66 59 38 ---	Black walnut, white ash, northern red oak, eastern white pine.
103A, 103B, 103C----- Seaton	4A	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple----- American basswood---	68 --- ---	63 --- ---	Black walnut, white ash, northern red oak, white oak
103D----- Seaton	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- Sugar maple----- American basswood--- White ash----- Black cherry-----	68 --- --- --- ---	63 --- --- --- ---	Black walnut, white ash, northern red oak, white oak.
173F----- Frontenac	4R	Severe	Severe	Severe	Slight	Northern red oak---- Quaking aspen----- White oak----- Black oak----- Bur oak-----	60 55 50 --- ---	51 53 34 --- ---	Eastern white pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	Volume*	
174D----- Gale	5R	Moderate	Moderate	Slight	Moderate	Northern red oak----	74	72	Northern red oak, white oak, eastern white pine.
						White oak-----	55	42	
						American basswood---	---	---	
194----- Huntsville	11A	Slight	Slight	Slight	Slight	Eastern cottonwood--	110	156	Black walnut, sugar maple, green ash, white ash, hackberry, white spruce.
						Green ash-----	---	---	
						Silver maple-----	---	---	
198C----- Rollingstone	4C	Slight	Severe	Slight	Severe	Northern red oak----	68	63	Northern red oak, American basswood, sugar maple, eastern white pine.
						White oak-----	55	42	
						Shagbark hickory----	55	---	
						American basswood---	55	42	
						Sugar maple-----	50	32	
198D----- Rollingstone	4R	Moderate	Severe	Slight	Severe	Northern red oak----	68	63	Northern red oak, American basswood, sugar maple, eastern white pine.
						White oak-----	55	42	
						Shagbark hickory----	55	---	
						American basswood---	55	42	
						Sugar maple-----	50	3	
215B, 215C----- Southridge	6A	Slight	Slight	Slight	Slight	Northern red oak----	82	83	Northern red oak, black walnut, white ash, eastern white pine.
						American basswood---	70	66	
						White oak-----	60	51	
						Black oak-----	52	2	
215D----- Southridge	6R	Moderate	Moderate	Slight	Slight	Northern red oak----	82	83	Black walnut, northern red oak, eastern white pine.
						American basswood---	70	66	
						White oak-----	60	51	
						Black oak-----	52	2	
262B----- Medary	4D	Slight	Slight	Moderate	Severe	Northern red oak----	65	59	Red pine, white spruce, white ash, northern red oak, eastern white pine.
						American basswood---	---	---	
						White oak-----	---	---	
						Sugar maple-----	---	---	
271----- Minneiska	9A	Slight	Slight	Slight	Slight	Eastern cottonwood--	100	128	Green ash, silver maple, eastern cottonwood.
						Boxelder-----	---	---	
283B, 283C----- Plainfield	9S	Slight	Moderate	Moderate	Slight	Eastern white pine--	64	133	Eastern white pine, red pine, Scotch pine.
						Black oak-----	---	---	
						Quaking aspen-----	---	---	
						Paper birch-----	---	---	
283D----- Plainfield	9R	Moderate	Moderate	Moderate	Slight	Eastern white pine--	64	133	Eastern white pine, red pine, Scotch pine.
						Quaking aspen-----	---	---	
						Black oak-----	---	---	
						Paper birch-----	---	---	

See footnotes at end of table.



TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Common trees	Site index	Volume*	
283F----- Plainfield	9R	Severe	Severe	Severe	Slight	Eastern white pine-- Bur oak----- Black oak-----	64 --- ---	133 --- ---	---
322C2----- Timula	5A	Slight	Slight	Slight	Slight	White oak----- Northern red oak--- Green ash-----	70 --- ---	4 --- ---	Black walnut, white ash, northern red oak, white oak.
322D2, 322E2---- Timula	5R	Moderate	Moderate	Moderate	Slight	White oak----- Northern red oak--- Green ash-----	70 --- ---	4 --- ---	Black walnut, white ash, northern red oak, white oak.
322F----- Timula	5R	Severe	Severe	Slight	Slight	White oak----- Northern red oak--- Green ash----- Bur oak-----	70 --- --- ---	66 --- --- ---	Northern red oak, green ash, eastern white pine.
369B, 369C----- Waubeek	4A	Slight	Slight	Slight	Slight	White oak----- Northern red oak---	65 65	59 59	Black walnut, sugar maple, white ash, northern red oak, white oak, eastern white pine.
388C----- Seaton	5A	Slight	Slight	Slight	Slight	Northern red oak--- Sugar maple----- American basswood--- Paper birch-----	70 --- --- ---	66 --- --- ---	Black walnut, white ash, northern red oak, white oak.
388D, 388E----- Seaton	5R	Moderate	Moderate	Slight	Slight	Northern red oak--- Sugar maple----- American basswood---	70 --- ---	66 --- ---	Black walnut, northern red oak, white ash, white oak.
401B, 401C----- Mt. Carroll	5A	Slight	Slight	Slight	Slight	Northern red oak--- American basswood--- Sugar maple-----	70 --- ---	66 --- ---	Black walnut, white ash, northern red oak, white oak.
401D----- Mt. Carroll	5R	Moderate	Moderate	Moderate	Slight	Northern red oak--- American basswood--- Sugar maple-----	70 --- ---	66 --- ---	Black walnut, white ash, northern red oak, white oak.
455A, 455B----- Festina	4A	Slight	Slight	Slight	Slight	White oak----- Northern red oak---	65 65	59 59	Black walnut, white ash, northern red oak, white oak.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	Volume*	
457E----- Lacrescent	2R	Moderate	Moderate	Slight	Slight	Northern red oak----	45	27	Eastern white pine, green ash.
						White oak-----	45	27	
						American basswood---	45	---	
						Bur oak-----	---	---	
						Black oak-----	---	---	
						Boxelder-----	---	---	
457G----- Lacrescent	2R	Severe	Severe	Slight	Slight	Northern red oak----	45	27	White oak,
						White oak-----	45	27	northern red
						American basswood---	45	---	oak, eastern white pine.
476B, 476C----- Frankville	4A	Slight	Slight	Slight	Slight	Northern red oak----	65	59	Eastern white pine, red
						White oak-----	65	59	pine, white spruce.
						Bur oak-----	---	---	
476D----- Frankville	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	65	59	Eastern white pine, red
						White oak-----	65	59	pine.
						Black oak-----	---	---	
						Bur oak-----	---	---	
492B, 492C----- Nasset	4A	Slight	Slight	Slight	Slight	White oak-----	65	4	Black walnut, white ash,
						Northern red oak----	65	4	northern red oak, white
									oak, sugar maple, eastern white pine.
493B----- Oronoco	5A	Slight	Slight	Slight	Slight	American basswood---	70	66	Black walnut, white ash,
						Northern red oak----	70	66	northern red oak, white
						White oak-----	65	59	oak, eastern white pine.
501B, 501C----- NewGlarus	3D	Slight	Slight	Slight	Moderate	Northern red oak----	57	46	Eastern white pine, red oak,
						Black oak-----	---	---	white oak.
						Bitternut hickory---	---	---	
501D, 501E----- NewGlarus	3R	Moderate	Moderate	Slight	Moderate	Northern red oak----	57	46	Eastern white pine, red oak,
						Black oak-----	---	---	white oak.
						Bitternut hickory---	---	---	
522----- Boots	3W	Slight	Severe	Severe	Severe	Tamarack-----	50	---	---
580B**, 580C**: Blackhammer----	4A	Slight	Slight	Slight	Slight	Northern red oak----	69	64	Black walnut, white ash,
						American basswood---	70	66	northern red oak, American
						White oak-----	60	51	basswood, sugar maple, eastern white pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	Volume*	
580B**, 580C**: Southridge-----	6A	Slight	Slight	Slight	Slight	Northern red oak---- American basswood--- White oak----- Black oak-----	82 70 60 70	83 66 51 2	Black walnut, white ash, northern red oak, eastern white pine.
580D**: Blackhammer----	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- American basswood--- White oak-----	69 70 60	64 66 51	Black walnut, white ash, northern red oak, American basswood, eastern white pine.
Southridge-----	6R	Moderate	Moderate	Slight	Slight	Northern red oak---- American basswood--- White oak----- Black oak-----	82 70 60 52	83 66 51 2	Black walnut, white ash, northern red oak, eastern white pine, red pine.
584F**: Lamoille-----	3R	Severe	Severe	Moderate	Moderate	Northern red oak---- American basswood--- White oak----- Shagbark hickory---- Sugar maple----- Quaking aspen-----	58 55 59 50 50 ---	48 42 49 --- 32 ---	Northern red oak, white oak, American basswood, eastern white pine.
Dorerton-----	4R	Severe	Severe	Slight	Slight	Northern red oak---- White oak----- Bur oak----- American basswood--- Black cherry----- Quaking aspen-----	68 50 50 50 50 60	63 34 34 34 32 64	Sugar maple, American basswood, eastern white pine.
586C**: Nodine-----	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----- Shagbark hickory---- American basswood--- Sugar maple-----	65 60 60 70 60	59 51 --- 66 38	Northern red oak, sugar maple, American basswood, eastern white pine.
Rollingstone---	4C	Slight	Severe	Slight	Severe	Northern red oak---- White oak----- Shagbark hickory---- American basswood--- Sugar maple-----	68 55 55 55 50	63 42 --- 42 32	Northern red oak, sugar maple, American basswood, eastern white pine.

See footnotes at end of table.



TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi- nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Common trees	Site index	Volume*	
586D**: Nodine-----	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	65	59	Northern red
						White oak-----	60	51	oak, American
						Shagbark hickory----	60	---	basswood,
						American basswood----	70	66	sugar maple,
						Sugar maple-----	60	38	eastern white pine.
Rollingstone---	4R	Moderate	Severe	Slight	Severe	Northern red oak----	68	63	Northern red
						White oak-----	55	42	oak, American
						Shagbark hickory----	55	---	basswood,
						American basswood----	55	42	sugar maple,
						Sugar maple-----	50	32	eastern white pine.
587B, 587C----- Palsgrove	4A	Slight	Slight	Slight	Slight	Northern red oak----	65	59	Black walnut,
						American basswood----	---	---	white ash, red oak, white oak, eastern white pine.
587D----- Palsgrove	4R	Moderate	Moderate	Moderate	Slight	Northern red oak----	65	59	Black walnut,
						American basswood----	---	---	white ash, red oak, white oak, eastern white pine.
592E**: Lamoille-----	3R	Moderate	Moderate	Moderate	Moderate	Northern red oak----	58	48	Sugar maple,
						American basswood----	55	42	American
						Green ash-----	50	34	basswood,
						White oak-----	59	49	eastern white
						Shagbark hickory----	50	---	pine.
						Sugar maple-----	50	32	
Elbaville-----	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	63	56	Sugar maple,
						White oak-----	55	42	American
						American basswood----	80	80	basswood,
						Sugar maple-----	65	40	eastern white
						Butternut-----	65	---	pine.
						Black walnut-----	65	---	
						Paper birch-----	65	65	
598B----- Beavercreek	3F	Slight	Moderate	Slight	Slight	Northern red oak----	55	42	Hackberry,
						Butternut-----	55	---	eastern
						Black walnut-----	55	---	cottonwood,
						Eastern cottonwood----	---	---	silver maple.
						Boxelder-----	---	---	
						Black willow-----	---	---	
						American basswood----	---	---	
599E----- Norden	4R	Moderate	Moderate	Slight	Slight	Northern red oak----	62	54	Eastern white
						Black oak-----	---	---	pine, red
						White oak-----	---	---	pine, Scotch
						Quaking aspen-----	---	---	pine.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	Volume*	
599F----- Norden	4R	Severe	Severe	Slight	Slight	Northern red oak---- Black oak----- White oak----- Quaking aspen-----	62 --- --- ---	54 --- --- ---	Eastern white pine.
604**: Huntsville----	11A	Slight	Slight	Slight	Slight	Eastern cottonwood-- Green ash----- Boxelder-----	110 --- ---	156 --- ---	Black walnut, green ash, hackberry, eastern cottonwood.
Beavercreek----	3F	Slight	Moderate	Slight	Slight	Northern red oak---- Butternut----- Black walnut----- Eastern cottonwood-- Boxelder----- Black willow----- American basswood---	55 55 55 --- --- --- ---	42 --- --- --- --- --- ---	Hackberry, eastern cottonwood, silver maple.
815F**: Elbaville-----	4R	Severe	Severe	Slight	Slight	Northern red oak---- American basswood--- Sugar maple----- Butternut----- Paper birch-----	63 80 65 65 65	56 80 40 --- 65	White ash, sugar maple, American basswood, eastern white pine.
Seaton-----	5R	Severe	Severe	Severe	Slight	Northern red oak---- Sugar maple----- American basswood---	68 76 71	63 47 67	White ash, sugar maple, black walnut, American basswood, eastern white pine.
826B**, 826C**: Gale-----	5D	Slight	Slight	Slight	Moderate	Northern red oak---- White oak----- American basswood---	74 --- ---	5 --- ---	Northern red oak, white oak, eastern white pine.
Blackhammer----	4A	Slight	Slight	Slight	Slight	Northern red oak---- American basswood--- White oak-----	69 70 60	64 66 51	Northern red oak, white oak, eastern white pine.
829C**: Seaton-----	4A	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple----- American basswood---	68 76 71	63 47 67	Black walnut, white ash, northern red oak, white oak, sugar maple.
Gale-----	5D	Slight	Slight	Slight	Moderate	Northern red oak---- White oak-----	74 ---	72 ---	Black walnut, white ash, northern red oak, white oak.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Wind-throw hazard	Common trees	Site index	Volume*	
830D**: Eleva-----	2R	Moderate	Moderate	Slight	Moderate	Black oak----- Jack pine----- Northern pin oak----- Northern red oak-----	45 --- --- ---	30 --- --- ---	Jack pine, red pine.
Seaton-----	5R	Moderate	Moderate	Slight	Slight	Northern red oak----- Black oak-----	68 ---	63 ---	Eastern white pine, red pine.
831F**: Spinks-----	2R	Moderate	Moderate	Moderate	Slight	Northern red oak----- Bur oak-----	40 35	21 22	Eastern white pine, red pine.
Boone-----	2R	Severe	Severe	Severe	Moderate	Black oak----- Northern red oak----- Black oak-----	44 --- ---	29 --- ---	Eastern white pine, red pine.
Sogn.									
832F**, 832G**: Lacrescent----	3R	Severe	Severe	Slight	Slight	Northern red oak----- White oak----- American basswood----- Eastern white pine----- Shagbark hickory-----	59 55 62 --- ---	49 42 54 --- ---	Eastern white pine.
Rock outcrop.									
1861----- Chaseburg	4A	Slight	Slight	Slight	Slight	Northern red oak----- Eastern cottonwood----- Silver maple----- Boxelder----- Black willow-----	65 --- --- --- ---	59 --- --- --- ---	Black walnut, white ash, sugar maple, American basswood.
1893B----- Beavercreek Variant	4A	Slight	Slight	Slight	Slight	Northern red oak----- Green ash----- Quaking aspen-----	60 60 65	51 51 73	White ash, green ash, silver maple.
1954B, 1954C---- Spinks	2S	Slight	Moderate	Moderate	Slight	Northern red oak----- Bur oak----- Black oak-----	40 35 ---	21 22 ---	Red pine, eastern white pine, Scotch pine.

\* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

\*\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
11B, 11D. Sogn					
19----- Chaseburg	---	Lilac, redosier dogwood.	White spruce, blue spruce, northern whitecedar, Amur maple.	Eastern white pine, Austrian pine, hackberry, green ash.	Silver maple.
24----- Kasson	---	Redosier dogwood, lilac.	White spruce, northern whitecedar, blue spruce, Amur maple.	Green ash, eastern white pine, hackberry, Austrian pine.	Silver maple.
25----- Becker	---	Redosier dogwood, common ninebark, lilac.	Northern whitecedar, white spruce, blue spruce, Amur maple.	Eastern white pine, Austrian pine, hackberry, green ash.	Silver maple.
79B----- Billett	Lilac, manyflower cotoneaster.	Russian-olive, Siberian peashrub, eastern redcedar.	Eastern white pine, red pine, Norway spruce, honeylocust, hackberry, green ash, Amur maple.	---	---
81B, 81C----- Boone	Manyflower cotoneaster.	Siberian peashrub, eastern redcedar, lilac, silky dogwood, gray dogwood, Amur maple, American cranberrybush.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
95C. Dunbarton					
99B, 99C----- Racine	---	Gray dogwood, Amur maple, American cranberrybush, lilac, northern whitecedar.	Black Hills spruce, Norway spruce, white spruce.	Red maple, white ash, red pine, eastern white pine.	---
103A, 103B, 103C, 103D----- Seaton	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
173F. Frontenac					

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
174D----- Gale	Lilac-----	Eastern redcedar, Siberian peashrub.	Eastern white pine, jack pine, green ash, hackberry, Russian-olive, Manchurian crabapple.	Honeylocust, Siberian elm.	---
176----- Garwin	---	Redosier dogwood, American plum.	Hackberry, Amur maple, northern whitecedar, tall purple willow, white spruce.	Golden willow, green ash.	Eastern cottonwood, silver maple.
194----- Huntsville	---	Redosier dogwood, lilac.	Blue spruce, Amur maple, northern whitecedar, white spruce.	Hackberry, green ash, eastern white pine, Austrian pine.	Silver maple.
198C, 198D----- Rollingstone	---	Eastern redcedar, northern whitecedar, lilac, Siberian peashrub.	Hackberry, bur oak, white spruce, Russian- olive, Austrian pine.	Eastern white pine, green ash.	---
215B, 215C, 215D-- Southridge	---	Gray dogwood, Siberian peashrub, redosier dogwood, lilac.	Northern whitecedar, eastern redcedar, hackberry, blue spruce, Russian- olive, Amur maple.	Eastern white pine, green ash.	---
262B----- Medary	---	Lilac, Siberian peashrub, eastern redcedar, northern whitecedar.	Austrian pine, white spruce, bur oak, hackberry, Russian-olive.	Eastern white pine, green ash.	---
271----- Minneiska	---	Northern whitecedar, lilac, Siberian peashrub.	Hackberry, white spruce, eastern redcedar, bur oak.	Honeylocust, golden willow, green ash.	Eastern cottonwood.
283B, 283C, 283D, 283F----- Plainfield	Lilac, Siberian peashrub.	Eastern redcedar	Red pine, Austrian pine, jack pine.	Eastern white pine	---
285A, 285B, 285C-- Port Byron	---	Redosier dogwood, Siberian peashrub, redosier dogwood, lilac.	Northern whitecedar, eastern redcedar, Russian-olive, hackberry, Amur maple, blue spruce.	Eastern white pine, green ash.	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
299B----- Rockton		Cotoneaster, lilac Eastern redcedar, Siberian peashrub.	Eastern white pine, green ash, hackberry, Manchurian crabapple, Russian-olive, jack pine.	Honeylocust, Siberian elm.	---
301A, 301C, 301D-- Lindstrom	---	Gray dogwood, Amur maple, American cranberrybush, lilac, northern whitecedar.	Black Hills spruce, Norway spruce, white spruce.	Red maple, white ash, red pine, eastern white pine.	---
322C2, 322D2, 322E2----- Timula	---	Osageorange, Russian-olive, eastern redcedar, Washington hawthorn.	Honeylocust, northern catalpa, green ash.	---	---
322F----- Timula	American plum-----	Eastern redcedar, hackberry, Siberian peashrub.	Russian-olive, green ash, honeylocust.	Siberian elm-----	---
331----- Tripoli	---	Siberian peashrub, lilac, northern whitecedar.	Hackberry, bur oak, eastern redcedar, white spruce.	Golden willow, green ash, honeylocust.	Eastern cottonwood.
369B, 369C----- Waubeek	---	Redosier dogwood, lilac, gray dogwood, Siberian peashrub.	Eastern redcedar, northern whitecedar, blue spruce, Amur maple, hackberry, Russian-olive.	Eastern white pine, green ash.	---
388C, 388D, 388E-- Seaton	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
401B, 401C, 401D-- Mt. Carroll	---	Northern whitecedar, redosier dogwood, Siberian peashrub, lilac, gray dogwood.	Russian-olive, hackberry, eastern redcedar, Amur maple.	Eastern white pine, green ash, red pine.	---
455A, 455B----- Festina	---	Redosier dogwood, gray dogwood, lilac, Siberian peashrub.	Eastern redcedar, northern whitecedar, Russian-olive, Amur maple, hackberry, blue spruce.	Green ash, eastern white pine.	---
457E, 457G. Lacrescent					



TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
468----- Otter	---	American plum, American cranberrybush, redosier dogwood, northern whitecedar, common ninebark, nannyberry viburnum.	Amur maple, white spruce, hackberry.	Green ash-----	Silver maple, eastern cottonwood.
474B. Haverhill					
476B, 476C, 476D-- Frankville	Lilac-----	Eastern redcedar, Siberian peashrub.	Hackberry, eastern white pine, Manchurian crabapple, Russian-olive, green ash.	Honeylocust, Siberian elm.	---
477----- Littleton	---	Northern whitecedar, American cranberrybush, redosier dogwood, nannyberry viburnum, lilac.	White spruce, Amur maple.	Hackberry, eastern white pine, red pine, green ash.	Silver maple.
483----- Waukee	Lilac, Siberian peashrub.	Eastern redcedar, Manchurian crabapple, hackberry.	Honeylocust, Russian-olive, green ash, bur oak, jack pine, eastern white pine.	---	---
484D----- Eyota	Lilac-----	Eastern redcedar, Siberian peashrub, Russian-olive, American plum.	Norway spruce, Amur maple, red pine, green ash, honeylocust, eastern white pine, hackberry.	---	---
488G. Brodale					
492B, 492C----- Nasset	---	Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Northern whitecedar, hackberry, blue spruce, eastern redcedar, Russian-olive, Amur maple.	Eastern white pine, green ash.	---
493B----- Oronoco	Lilac-----	Eastern redcedar, Siberian peashrub, Russian-olive.	Honeylocust, red pine, Norway spruce, green ash, eastern white pine, hackberry, Amur maple.	---	---

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
501B, 501C, 501D, 501E----- NewGlarus	Manyflower cotoneaster.	Eastern redcedar, silky dogwood, Siberian peashrub, lilac, American cranberrybush, Amur maple, gray dogwood.	Norway spruce-----	Eastern white pine, jack pine, red pine.	---
522. Boots					
576, 577----- Newalbin	---	American plum, redosier dogwood.	Tall purple willow, hackberry, northern whitecedar, white spruce, Amur maple.	Golden willow, green ash.	Eastern cottonwood, silver maple.
578. Newalbin					
580B*, 580C*, 580D*: Blackhammer-----	---	Gray dogwood, Siberian peashrub, redosier dogwood, lilac.	Northern whitecedar, eastern redcedar, hackberry, blue spruce, Russian- olive, Amur maple.	Eastern white pine, green ash.	---
Southridge-----	---	Gray dogwood, Siberian peashrub, redosier dogwood, lilac.	Northern whitecedar, eastern redcedar, hackberry, blue spruce, Russian- olive, Amur maple.	Eastern white pine, green ash.	---
584F*: Lamoille.					
Dorerton.					
586C*: Nodine-----	---	Siberian peashrub, lilac, gray dogwood, redosier dogwood.	Eastern redcedar, blue spruce, northern whitecedar, Amur maple, hackberry, Russian-olive.	Eastern white pine, green ash.	---
Rollingstone-----	---	Eastern redcedar, northern whitecedar, lilac, Siberian peashrub.	Hackberry, bur oak, white spruce, Russian- olive, Austrian pine.	Eastern white pine, green ash.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
586D*: Nodine-----	---	Siberian peashrub, lilac, gray dogwood, redosier dogwood.	Eastern redcedar, blue spruce, northern whitecedar, Amur maple, hackberry, Russian-olive.	Eastern white pine, green ash.	---
Rollingstone----	---	Eastern redcedar, northern whitecedar, lilac, Siberian peashrub.	Hackberry, bur oak, white spruce, Russian- olive, Austrian pine.	Eastern white pine, green ash.	---
587B, 587C, 587D-- Palsgrove	---	Northern whitecedar, Siberian peashrub, gray dogwood, redosier dogwood, lilac.	Hackberry, Amur maple, Russian- olive, eastern redcedar.	Red pine, eastern white pine, green ash.	---
592E*: Lamoille.					
Elbaville-----	Lilac, Siberian peashrub.	Manchurian crabapple, hackberry, eastern redcedar.	Eastern white pine, honeylocust, jack pine, bur oak, green ash, Russian-olive.	---	---
598B. Beavercreek					
599E, 599F----- Norden	---	Lilac-----	Northern whitecedar, Siberian crabapple, white spruce, Amur maple.	Green ash, bur oak, eastern white pine, ponderosa pine, hackberry.	Silver maple.
604*: Huntsville-----	---	Redosier dogwood, lilac.	Blue spruce, Amur maple, northern whitecedar, white spruce.	Hackberry, green ash, eastern white pine, Austrian pine.	Silver maple.
Beavercreek.					
606----- Shiloh	---	---	---	---	---
815F*: Elbaville-----	Lilac, Siberian peashrub.	Manchurian crabapple, hackberry, eastern redcedar.	Eastern white pine, honeylocust, jack pine, bur oak, green ash, Russian-olive.	---	---

See footnote at end of table.



TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
815F*: Seaton-----	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
826B*, 826C*: Gale-----	Lilac-----	Eastern redcedar, Siberian peashrub.	Eastern white pine, jack pine, green ash, hackberry, Russian-olive, Manchurian crabapple.	Honeylocust, Siberian elm.	---
Blackhammer-----	---	Gray dogwood, Siberian peashrub, redosier dogwood, lilac.	Northern whitecedar, eastern redcedar, hackberry, blue spruce, Russian- olive, Amur maple.	Eastern white pine, green ash.	---
829C*: Seaton-----	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
Gale-----	Lilac-----	Eastern redcedar, Siberian peashrub.	Eastern white pine, jack pine, green ash, hackberry, Russian-olive, Manchurian crabapple.	Honeylocust, Siberian elm.	---
830D*: Eleva-----	Siberian peashrub	Autumn-olive, eastern redcedar, radiant crabapple, silky dogwood, Washington hawthorn, Amur honeysuckle, lilac, Amur maple, gray dogwood, Siberian peashrub.	Eastern white pine, Austrian pine, red pine, jack pine, eastern redcedar, Norway spruce.	Eastern white pine, red pine, jack pine.	---

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
830D*: Seaton-----	---	Gray dogwood, redosier dogwood, lilac, Siberian peashrub.	Hackberry, northern whitecedar, Russian-olive, eastern redcedar, Amur maple, blue spruce.	Eastern white pine, green ash.	---
831F*: Spinks-----	Siberian peashrub	Lilac, Amur honeysuckle, eastern redcedar, Siberian crabapple, silver buffaloberry.	Red pine, green ash, Russian- olive, thornless honeylocust, jack pine.	Eastern white pine	---
Boone-----	Manyflower cotoneaster.	Siberian peashrub, eastern redcedar, lilac, silky dogwood, gray dogwood, Amur maple, American cranberrybush.	Norway spruce-----	Eastern white pine, red pine, jack pine.	---
Sogn.					
832F*, 832G*: Lacrescent.					
Rock outcrop.					
839*: Urban land.					
Minneopa-----	---	Lilac, redosier dogwood.	Northern whitecedar, white spruce, blue spruce, Amur maple.	Eastern white pine, Austrian pine, green ash, hackberry.	Silver maple.
840*: Urban land.					
Finchford-----	Siberian peashrub, lilac.	Eastern redcedar, sargent crabapple.	Siberian elm, red pine, jack pine, Austrian pine, green ash, Russian-olive.	Eastern white pine	---
898F*: Bellechester-----	Lilac, Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar	Red pine, jack pine, Austrian pine.	Eastern white pine	---
Brodale.					

See footnote at end of table.

TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1002. Fluvaquents					
1010*. Riverwash					
1013*. Pits, quarries					
1015. Psamments					
1016. Udorthents					
1029*. Pits, gravel					
1822B. Abscota Variant					
1830, 1857----- Eitzen	---	Lilac, redosier dogwood.	Northern whitecedar, blue spruce, white spruce, Amur maple.	Eastern white pine, hackberry, green ash, Austrian pine.	Silver maple.
1860----- Comfrey	---	American plum, redosier dogwood.	Hackberry, tall purple willow, northern whitecedar, white spruce, Amur maple.	Golden willow, green ash.	Eastern cottonwood, silver maple.
1861----- Chaseburg	---	Lilac, redosier dogwood.	White spruce, blue spruce, northern whitecedar, Amur maple.	Eastern white pine, Austrian pine, hackberry, green ash.	Silver maple.
1893B----- Beavercreek Variant	---	Lilac, redosier dogwood.	Northern whitecedar, blue spruce, white spruce, Amur maple.	Green ash, hackberry, Austrian pine, eastern white pine.	Silver maple.
1936----- Hoopeston	---	Siberian peashrub, Amur honeysuckle, redosier dogwood.	White spruce, Russian-olive, northern whitecedar, tall purple willow.	Eastern white pine, Norway spruce, green ash, hackberry.	Silver maple.
1937----- Lawler	---	Lilac, redosier dogwood.	Northern whitecedar, white spruce, blue spruce, Amur maple.	Eastern white pine, hackberry, Austrian pine, green ash.	Silver maple.

See footnote at end of table.



TABLE 8.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
1951A, 1951B----- Flagler	---	Siberian crabapple, Siberian peashrub, Amur honeysuckle.	Red pine, white spruce, hackberry, Amur maple, Russian-olive, northern whitecedar.	Norway spruce, eastern white pine, green ash.	---
1952B, 1952C----- Keltner	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
1953----- Marshan	---	Redosier dogwood, American plum, Amur honeysuckle.	Hackberry, northern whitecedar, Amur maple, white spruce, tall purple willow.	Golden willow, green ash.	Silver maple, eastern cottonwood.
1954B, 1954C----- Spinks	Siberian peashrub	Lilac, Amur honeysuckle, eastern redcedar, Siberian crabapple, silver buffaloberry.	Red pine, green ash, Russian-olive, thornless honeylocust, jack pine.	Eastern white pine	---
1955A, 1955B----- Waukee	Lilac, Siberian peashrub.	Eastern redcedar, Manchurian crabapple, hackberry.	Honeylocust, Russian-olive, green ash, bur oak, jack pine, eastern white pine.	---	---
1960B----- Haverhill Variant	---	Redosier dogwood	Amur maple, Norway spruce, blue spruce.	Siberian elm, green ash, eastern white pine, thornless honeylocust, golden willow.	Eastern cottonwood, silver maple.
1990----- Otter	---	American plum, American cranberrybush, redosier dogwood, northern whitecedar, common ninebark, nannyberry viburnum.	Amur maple, white spruce, hackberry.	Green ash-----	Silver maple, eastern cottonwood.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
11B----- Sogn	Severe: thin layer, area reclaim.	Severe: thin layer, area reclaim.	Severe: thin layer.	Slight-----	Severe: thin layer, area reclaim.
11D----- Sogn	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer.	Moderate: slope.	Severe: slope, thin layer, area reclaim.
19----- Chaseburg	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
24----- Kasson	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight-----	Slight.
25----- Becker	Severe: flooding.	Slight-----	Slight-----	Slight-----	Slight.
79B----- Billett	Slight-----	Slight-----	Moderate: slope.	Slight-----	Moderate: droughty.
81B----- Boone	Slight-----	Slight-----	Moderate: slope, small stones.	Slight-----	Severe: droughty.
81C----- Boone	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Severe: droughty.
95C----- Dunbarton	Severe: thin layer, area reclaim.	Severe: thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: erodes easily.	Severe: thin layer, area reclaim.
99B----- Racine	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
99C----- Racine	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
103A, 103B----- Seaton	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
103C----- Seaton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
103D----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
173F----- Frontenac	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
174D----- Gale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
176----- Garwin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
194----- Huntsville	Severe: flooding.	Slight-----	Slight-----	Slight-----	Slight.
198C----- Rollingstone	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight.
198D----- Rollingstone	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
215B----- Southridge	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
215C----- Southridge	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
215D----- Southridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
262B----- Medary	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
271----- Minneiska	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
283B----- Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
283C----- Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty.
283D----- Plainfield	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Severe: droughty, slope.
283F----- Plainfield	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: slope, too sandy.	Severe: too sandy, slope.	Severe: droughty, slope.
285A, 285B----- Port Byron	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
285C----- Port Byron	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
299B----- Rockton	Slight-----	Slight-----	Moderate: slope, thin layer, area reclaim.	Slight-----	Moderate: thin layer, area reclaim.
301A----- Lindstrom	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
301C----- Lindstrom	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
301D----- Lindstrom	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
322C2----- Timula	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
322D2----- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
322E2, 322F----- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
331----- Tripoli	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
369B----- Waubeeek	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
369C----- Waubeeek	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
388C----- Seaton	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
388D----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
388E----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
401B----- Mt. Carroll	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
401C----- Mt. Carroll	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
401D----- Mt. Carroll	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
455A----- Festina	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
455B----- Festina	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
457E----- Lacrescent	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
457G----- Lacrescent	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
468----- Otter	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
474B----- Haverhill	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
476B----- Frankville	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, thin layer, area reclaim.	Slight-----	Moderate: thin layer, area reclaim.



TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
476C----- Frankville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope, thin layer, area reclaim.
476D----- Frankville	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
477----- Littleton	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
483----- Waukee	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
484D----- Eyota	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
488G----- Brodale	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
492B----- Nasset	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
492C----- Nasset	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
493B----- Oronoco	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
501B----- NewGlarus	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, thin layer, area reclaim.	Slight-----	Moderate: thin layer, area reclaim.
501C----- NewGlarus	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
501D, 501E----- NewGlarus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
522----- Boots	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
576, 577----- Newalbin	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
578----- Newalbin	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
580B*: Blackhammer-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
580B*: Southridge-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
580C*: Blackhammer-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Southridge-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
580D*: Blackhammer-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Southridge-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
584F*: Lamoille-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Dorerton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
586C*: Nodine-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Rollingstone-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
586D*: Nodine-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Rollingstone-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
587B----- Palsgrove	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
587C----- Palsgrove	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
587D----- Palsgrove	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
592E*: Lamoille-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Elbaville-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
598B----- Beavercreek	Severe: flooding.	Moderate: flooding.	Moderate: slope.	Moderate: flooding.	Severe: flooding.
599E----- Norden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
599F----- Norden	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
604*: Huntsville-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
Beavercreek-----	Severe: flooding.	Slight-----	Severe: small stones.	Severe: erodes easily.	Moderate: small stones, droughty, flooding.
606----- Shiloh	Severe: flooding, ponding, too clayey.	Severe: ponding, too clayey.	Severe: ponding, flooding.	Severe: ponding, too clayey.	Severe: ponding, flooding.
815F*: Elbaville-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Seaton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
826B*: Gale-----	Slight-----	Slight-----	Moderate: slope, thin layer, area reclaim.	Slight-----	Moderate: thin layer, area reclaim.
Blackhammer-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
826C*: Gale-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.
Blackhammer-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
829C*: Seaton-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gale-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer, area reclaim.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
830D*: Eleva-----	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.
Seaton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
831F*: Spinks-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Boone-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sogn-----	Severe: slope, thin layer, area reclaim.	Severe: slope, thin layer, area reclaim.	Severe: slope, small stones, thin layer.	Severe: slope.	Severe: slope, thin layer, area reclaim.
832F*, 832G*: Lacrescent-----	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Rock outcrop.					
839*: Urban land.					
Minneopa-----	Severe: flooding.	Slight-----	Moderate: small stones.	Slight-----	Moderate: droughty.
840*: Urban land.					
Finchford-----	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight-----	Moderate: small stones, droughty.
898F*: Bellechester-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Brodale-----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
1002. Fluvaquents					
1010*. Riverwash					
1013*. Pits, quarries					
1015. Psamments					

See footnote at end of table.



TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1016. Udorthents					
1029*. Pits, gravel					
1822B----- Abscota Variant	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty, flooding, too sandy.
1830, 1857----- Eitzen	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
1860----- Comfrey	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
1861----- Chaseburg	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
1893B----- Beavercreek Variant	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight-----	Moderate: small stones, large stones, flooding.
1936----- Hoopeston	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1937----- Lawler	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight-----	Slight.
1951A----- Flagler	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
1951B----- Flagler	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
1952B----- Keltner	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
1952C----- Keltner	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
1953----- Marshan	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1954B----- Spinks	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, too sandy.	Moderate: too sandy.	Moderate: droughty.
1954C----- Spinks	Moderate: slope, too sandy.	Moderate: slope, too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty, slope.
1955A----- Waukee	Slight-----	Slight-----	Slight-----	Slight-----	Slight.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
1955B----- Waukee	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
1960B----- Haverhill Variant	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
1990----- Otter	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
11B, 11D----- Sogn	Very poor.	Very poor.	Poor	Fair	Good	Very poor.	Very poor.	Very poor.	Fair	Very poor.
19----- Chaseburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
24----- Kasson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Fair	Very poor.
25----- Becker	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Good.
79B----- Billett	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
81B, 81C----- Boone	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
95C----- Dunbarton	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
99B----- Racine	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
99C----- Racine	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
103A, 103B----- Seaton	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
103C----- Seaton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
103D----- Seaton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
173F----- Frontenac	Very poor.	Very poor.	Poor	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
174D----- Gale	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
176----- Garwin	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
194----- Huntsville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
198C----- Rollingstone	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
198D----- Rollingstone	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
215B----- Southridge	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
215C----- Southridge	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
215D----- Southridge	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
262B----- Medary	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
271----- Minneiska	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
283B----- Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
283C, 283D, 283F--- Plainfield	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
285A, 285B----- Port Byron	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
285C----- Port Byron	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
299B----- Rockton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
301A----- Lindstrom	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
301C----- Lindstrom	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
301D----- Lindstrom	Poor	Fair	Good	Good	Good	Poor	Poor	Good	Good	Poor.
322C2----- Timula	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
322D2----- Timula	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
322E2, 322F----- Timula	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
331----- Tripoli	Good	Good	Good	Fair	Poor	Good	Good	Good	Fair	Good.
369B----- Waubeek	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
369C----- Waubeek	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
388C----- Seaton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
388D----- Seaton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
388E----- Seaton	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.



TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
401B----- Mt. Carroll	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
401C----- Mt. Carroll	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
401D----- Mt. Carroll	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
455A, 455B----- Festina	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
457E, 457G----- Lacrescent	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
468----- Otter	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
474B----- Haverhill	Very poor.	Fair	Fair	Poor	Poor	Good	Poor	Poor	Poor	Fair.
476B----- Frankville	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
476C----- Frankville	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
476D----- Frankville	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
477----- Littleton	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
483----- Waukee	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
484D----- Eyota	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
488G----- Brodale	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.
492B, 492C----- Nasset	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
493B----- Oronoco	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Poor.
501B, 501C----- NewGlarus	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
501D----- NewGlarus	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
501E----- NewGlarus	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
522----- Boots	Good	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
576----- Newalbin	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
577----- Newalbin	Poor	Poor	Fair	Fair	Fair	Good	Good	Poor	Fair	Good.
578----- Newalbin	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
580B*: Blackhammer-----	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Southridge-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
580C*: Blackhammer-----	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Southridge-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
580D*: Blackhammer-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Southridge-----	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
584F*: Lamoille-----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
Dorerton-----	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
586C*: Nodine-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rollingstone-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
586D*: Nodine-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Rollingstone-----	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
587B----- Palsgrove	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
587C----- Palsgrove	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
587D----- Palsgrove	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
592E*: Lamoille-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
592E*: Elbaville-----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
598B----- Beavercreek	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
599E----- Norden	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
599F----- Norden	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
604*: Huntsville-----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Beavercreek-----	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.
606----- Shiloh	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
815F*: Elbaville-----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Seaton-----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
826B*: Gale-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Blackhammer-----	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
826C*: Gale-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Blackhammer-----	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
829C*: Seaton-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gale-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
830D*: Eleva-----	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Seaton-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
831F*: Spinks-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
831F*: Boone-----	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Sogn-----	Very poor.	Very poor.	Poor	---	---	Very poor.	Very poor.	Very poor.	---	Very poor.
832F*, 832G*: Lacrescent-----	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Rock outcrop.										
839*: Urban land.										
Minneopa-----	Fair	Fair	Fair	Fair	Fair	Poor	Poor	Fair	Fair	Poor.
840*: Urban land.										
Finchford-----	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
898F*: Bellechester-----	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Brodale-----	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.
1002. Fluvaquents										
1010*. Riverwash										
1013*. Pits, quarries										
1015. Psammments										
1016. Udorthents										
1029*. Pits, gravel										
1822B----- Abscota Variant	Fair	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
1830, 1857----- Eitzen	Good	Good	Good	Good	Fair	Poor	Poor	Good	Good	Poor.
1860----- Comfrey	Poor	Poor	Fair	Very poor.	Very poor.	Good	Good	Poor	Poor	Good.
1861----- Chaseburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.



TABLE 10.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
1893B----- Beavercreek Variant	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
1936----- Hoopeston	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
1937----- Lawler	Good	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
1951A----- Flagler	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
1951B----- Flagler	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
1952B----- Keltner	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1952C----- Keltner	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
1953----- Marshan	Good	Good	Good	Fair	Poor	Fair	Good	Good	Fair	Good.
1954B----- Spinks	Fair	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
1954C----- Spinks	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
1955A, 1955B----- Waukee	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
1960B----- Haverhill Variant	Poor	Poor	Poor	Fair	Poor	Poor	Poor	Poor	Good	Poor.
1990----- Otter	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
11B----- Sogn	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer, area reclaim.
11D----- Sogn	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer, area reclaim.
19----- Chaseburg	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
24----- Kasson	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
25----- Becker	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
79B----- Billett	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action.	Moderate: droughty.
81B----- Boone	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight-----	Severe: droughty.
81C----- Boone	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
95C----- Dunbarton	Severe: depth to rock.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, shrink-swell.	Severe: thin layer, area reclaim.
99B----- Racine	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.	Slight.
99C----- Racine	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
103A----- Seaton	Slight-----	Slight-----	Slight-----	Slight-----	Severe: low strength, frost action.	Slight.
103B----- Seaton	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: low strength, frost action.	Slight.
103C----- Seaton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
103D----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
173F----- Frontenac	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
174D----- Gale	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
176----- Garwin	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: frost action, low strength, shrink-swell.	Moderate: wetness.
194----- Huntsville	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.
198C----- Rollingstone	Moderate: too clayey, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, slope, large stones.	Severe: low strength.	Slight.
198D----- Rollingstone	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
215B----- Southridge	Moderate: too clayey.	Slight-----	Moderate: shrink-swell.	Moderate: slope.	Severe: frost action.	Slight.
215C----- Southridge	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action.	Moderate: slope.
215D----- Southridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
262B----- Medary	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength.	Slight.
271----- Minneiska	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
283B----- Plainfield	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Severe: droughty.
283C----- Plainfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Severe: droughty.
283D, 283F----- Plainfield	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
285A----- Port Byron	Slight-----	Slight-----	Slight-----	Slight-----	Severe: low strength, frost action.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
285B----- Port Byron	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: low strength, frost action.	Slight.
285C----- Port Byron	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
299B----- Rockton	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: thin layer, area reclaim.
301A----- Lindstrom	Slight-----	Slight-----	Slight-----	Slight-----	Severe: frost action.	Slight.
301C----- Lindstrom	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
301D----- Lindstrom	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
322C2----- Timula	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
322D2, 322E2, 322F----- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
331----- Tripoli	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
369B----- Waubeek	Slight-----	Moderate: shrink-swell.	Slight-----	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
369C----- Waubeek	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
388C----- Seaton	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
388D, 388E----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
401B----- Mt. Carroll	Slight-----	Slight-----	Slight-----	Moderate: slope.	Severe: low strength, frost action.	Slight.
401C----- Mt. Carroll	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
401D----- Mt. Carroll	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.



TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
455A----- Festina	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
455B----- Festina	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
457E, 457G----- Lacrescent	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
468----- Otter	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.
474B----- Haverhill	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
476B----- Frankville	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength, frost action.	Moderate: thin layer, area reclaim.
476C----- Frankville	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
476D----- Frankville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
477----- Littleton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
483----- Waukee	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
484D----- Eyota	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
488G----- Brodale	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
492B----- Nasset	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
492C----- Nasset	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
493B----- Oronoco	Slight-----	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.	Slight.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
501B----- NewGlarus	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Moderate: thin layer, area reclaim.
501C----- NewGlarus	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
501D, 501E----- NewGlarus	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
522----- Boots	Severe: excess humus, ponding.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: subsides, ponding, low strength.	Severe: ponding, frost action, subsides.	Severe: ponding, excess humus.
576, 577----- Newalbin	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
578----- Newalbin	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: ponding, flooding, frost action.	Severe: ponding.
580B*: Blackhammer-----	Slight-----	Slight-----	Moderate: shrink-swell.	Moderate: slope.	Severe: frost action, low strength.	Slight.
Southridge-----	Moderate: too clayey.	Slight-----	Moderate: shrink-swell.	Moderate: slope.	Severe: frost action.	Slight.
580C*: Blackhammer-----	Moderate: slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Southridge-----	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action.	Moderate: slope.
580D*: Blackhammer-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action, low strength.	Severe: slope.
Southridge-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
584F*: Lamoille-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
584F*: Dorerton-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
586C*: Nodine-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
Rollingstone-----	Moderate: too clayey, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Severe: low strength.	Moderate: slope.
586D*: Nodine-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rollingstone-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
587B----- Palsgrove	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
587C----- Palsgrove	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
587D----- Palsgrove	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
592E*: Lamoille-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Elbaville-----	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
598B----- Beavercreek	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
599E, 599F----- Norden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
604*: Huntsville-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
604*: Beavercreek-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, droughty, flooding.
606----- Shiloh	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding, flooding.
815F*: Elbaville-----	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Seaton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
826B*: Gale-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Severe: low strength, frost action.	Moderate: thin layer, area reclaim.
Blackhammer-----	Slight-----	Slight-----	Moderate: shrink-swell.	Moderate: slope.	Severe: frost action, low strength.	Slight.
826C*: Gale-----	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
Blackhammer-----	Moderate: slope.	Moderate: slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
829C*: Seaton-----	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Gale-----	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope, thin layer, area reclaim.
830D*: Eleva-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Seaton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

See footnote at end of table.



TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
831F*: Spinks-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Boone-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sogn-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer, area reclaim.
832F*, 832G*: Lacrescent-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
839*: Urban land.						
Minneopa-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Moderate: droughty.
840*: Urban land.						
Finchford-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: small stones, droughty.
898F*: Bellechester-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Brodale-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
1002. Fluvaquents						
1010*. Riverwash						
1013*. Pits, quarries						
1015. Psammments						
1016. Udorthents						
1029*. Pits, gravel						

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1822B----- Abscota Variant	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding, too sandy.
1830, 1857----- Eitzen	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
1860----- Comfrey	Severe: wetness, excess humus.	Severe: flooding, wetness, low strength.	Severe: flooding, wetness.	Severe: flooding, wetness, low strength.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
1861----- Chaseburg	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Moderate: flooding.
1893B----- Beavercreek Variant	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: small stones, large stones, flooding.
1936----- Hoopeston	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
1937----- Lawler	Severe: cutbanks cave, wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: frost action.	Slight.
1951A----- Flagler	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Moderate: frost action.	Slight.
1951B----- Flagler	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Moderate: frost action.	Slight.
1952B----- Keltner	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
1952C----- Keltner	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
1953----- Marshan	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
1954B----- Spinks	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: droughty.
1954C----- Spinks	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
1955A----- Waukee	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1955B----- Waukee	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
1960B----- Haverhill Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
1990----- Otter	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness.	Severe: wetness.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
11B----- Sogn	Severe: thin layer, seepage.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
11D----- Sogn	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
19----- Chaseburg	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
24----- Kasson	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
25----- Becker	Severe: poor filter.	Severe: seepage.	Severe: seepage, wetness, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
79B----- Billett	Slight-----	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too sandy, small stones.
81B----- Boone	Severe: thin layer, seepage, poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, seepage, too sandy.
81C----- Boone	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, seepage, too sandy.
95C----- Dunbarton	Severe: thin layer, seepage.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Severe: seepage.	Poor: area reclaim, too clayey, hard to pack.
99B----- Racine	Slight-----	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey, small stones.
99C----- Racine	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
103A, 103B----- Seaton	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
103C----- Seaton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.



TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
103D----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
173F----- Frontenac	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
174D----- Gale	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
176----- Garwin	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
194----- Huntsville	Moderate: flooding, wetness, percs slowly.	Moderate: seepage.	Severe: wetness.	Moderate: flooding, wetness.	Good.
198C----- Rollingstone	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack, small stones.
198D----- Rollingstone	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, small stones.
215B----- Southridge	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
215C----- Southridge	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
215D----- Southridge	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
262B----- Medary	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
271----- Minneiska	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: too sandy.
283B----- Plainfield	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
283C----- Plainfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
283D, 283F----- Plainfield	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
285A, 285B----- Port Byron	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
285C----- Port Byron	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
299B----- Rockton	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Moderate: seepage.	Poor: area reclaim, thin layer.
301A----- Lindstrom	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
301C----- Lindstrom	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
301D----- Lindstrom	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
322C2----- Timula	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
322D2, 322E2, 322F-- Timula	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
331----- Tripoli	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
369B----- Waubeeek	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
369C----- Waubeeek	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
388C----- Seaton	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
388D, 388E----- Seaton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
401B----- Mt. Carroll	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.
401C----- Mt. Carroll	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
401D----- Mt. Carroll	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
455A----- Festina	Slight-----	Moderate: seepage.	Severe: seepage.	Slight-----	Fair: too clayey.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
455B----- Festina	Slight-----	Moderate: slope, seepage.	Severe: seepage.	Slight-----	Fair: too clayey.
457E, 457G----- Lacrescent	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
468----- Otter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
474B----- Haverhill	Severe: thin layer, seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness, too clayey.	Severe: wetness.	Poor: area reclaim, too clayey, hard to pack.
476B----- Frankville	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Moderate: seepage.	Poor: area reclaim, thin layer.
476C----- Frankville	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage.	Moderate: seepage, slope.	Poor: area reclaim, thin layer.
476D----- Frankville	Severe: thin layer, seepage, percs slowly.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.
477----- Littleton	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
483----- Waukee	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
484D----- Eyota	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
488G----- Brodale	Severe: slope.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
492B----- Nasset	Severe: percs slowly.	Moderate: seepage, slope.	Severe: depth to rock.	Slight-----	Poor: thin layer.
492C----- Nasset	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: slope.	Poor: thin layer.
493B----- Oronoco	Slight-----	Moderate: seepage, slope.	Slight-----	Slight-----	Good.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
501B----- NewGlarus	Severe: thin layer, seepage.	Severe: seepage.	Severe: seepage.	Moderate: seepage.	Poor: area reclaim, thin layer.
501C----- NewGlarus	Severe: thin layer, seepage.	Severe: seepage, slope.	Severe: seepage.	Moderate: seepage, slope.	Poor: area reclaim, thin layer.
501D, 501E----- NewGlarus	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.
522----- Boots	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: seepage, ponding.	Poor: ponding, excess humus.
576, 577----- Newalbin	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
578----- Newalbin	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
580B*: Blackhammer-----	Slight-----	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Poor: small stones.
Southridge-----	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight-----	Poor: too clayey, hard to pack.
580C*: Blackhammer-----	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
Southridge-----	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
580D*: Blackhammer-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, small stones.
Southridge-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
584F*: Lamoille-----	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.

See footnote at end of table.



TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
584F*: Dorerton-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: seepage, small stones, slope.
586C*: Nodine-----	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, small stones.	Moderate: slope.	Poor: small stones.
Rollingstone-----	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack, small stones.
586D*: Nodine-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Rollingstone-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, small stones.
587B----- Palsgrove	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Slight-----	Poor: thin layer.
587C----- Palsgrove	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, seepage.	Moderate: slope.	Poor: thin layer.
587D----- Palsgrove	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, seepage, slope.	Severe: slope.	Poor: slope, thin layer.
592E*: Lamoille-----	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: small stones, slope.
Elbaville-----	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: large stones, too sandy, seepage.
598B----- Beavercreek	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: too sandy, large stones.
599E, 599F----- Norden	Severe: thin layer, seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: area reclaim, slope, thin layer.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
604*: Huntsville-----	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
Beavercreek-----	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: too sandy, large stones.
606----- Shiloh	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
815F*: Elbaville-----	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: large stones, too sandy, seepage.
Seaton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
826B*: Gale-----	Severe: thin layer, seepage, poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
Blackhammer-----	Slight-----	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Poor: small stones.
826C*: Gale-----	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
Blackhammer-----	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
829C*: Seaton-----	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Gale-----	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: area reclaim, thin layer.
830D*: Eleva-----	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope.
Seaton-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
831F*: Spinks-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Boone-----	Severe: thin layer, seepage, poor filter.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, seepage, too sandy.
Sogn-----	Severe: thin layer, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: area reclaim, slope, thin layer.
832F*, 832G*: Lacrescent-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Rock outcrop.					
839*: Urban land.					
Minneopa-----	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: seepage, too sandy.
840*: Urban land.					
Finchford-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
898F*: Bellechester-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: seepage, too sandy, large stones.
Brodale-----	Severe: slope.	Severe: seepage, slope, large stones.	Severe: depth to rock, seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
1002. Fluvaquents					
1010*. Riverwash					
1013*. Pits, quarries					
1015. Psammments					

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1016. Udorthents					
1029*. Pits, gravel					
1822B----- Abscota Variant	Severe: flooding, wetness, poor filter.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage, too sandy.
1830, 1857----- Eitzen	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
1860----- Comfrey	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
1861----- Chaseburg	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
1893B----- Beavercreek Variant	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: small stones.
1936----- Hoopeston	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness, thin layer.
1937----- Lawler	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: thin layer.
1951A, 1951B----- Flagler	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
1952B----- Keltner	Severe: wetness, percs slowly.	Severe: wetness.	Severe: seepage.	Slight-----	Poor: thin layer.
1952C----- Keltner	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: seepage.	Moderate: slope.	Poor: thin layer.
1953----- Marshan	Severe: wetness, percs slowly, poor filter.	Severe: seepage, wetness.	Severe: wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, wetness.
1954B----- Spinks	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.
1954C----- Spinks	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage, too sandy.

See footnote at end of table.



TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
1955A, 1955B----- Waukee	Severe: percs slowly, poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
1960B----- Haverhill Variant	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1990----- Otter	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
11B----- Sogn	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, thin layer.
11D----- Sogn	Poor: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, thin layer.
19----- Chaseburg	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
24----- Kasson	Fair: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
25----- Becker	Good-----	Probable-----	Improbable: too sandy.	Fair: small stones, area reclaim, thin layer.
79B----- Billett	Good-----	Probable-----	Improbable: too sandy.	Fair: small stones, area reclaim.
81B, 81C----- Boone	Poor: area reclaim.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
95C----- Dunbarton	Poor: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, thin layer.
99B----- Racine	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
99C----- Racine	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
103A, 103B----- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
103C----- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
103D----- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
173F----- Frontenac	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
174D----- Gale	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
176----- Garwin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
194----- Huntsville	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
198C----- Rollingstone	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
198D----- Rollingstone	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
215B----- Southridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
215C----- Southridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope, thin layer.
215D----- Southridge	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
262B----- Medary	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
271----- Minneiska	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
283B, 283C----- Plainfield	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
283D----- Plainfield	Fair: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
283F----- Plainfield	Poor: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.
285A, 285B----- Port Byron	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
285C----- Port Byron	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
299B----- Rockton	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
301A----- Lindstrom	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
301C----- Lindstrom	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
301D----- Lindstrom	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
322C2----- Timula	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
322D2----- Timula	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
322E2, 322F----- Timula	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
331----- Tripoli	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
369B----- Waubeek	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
369C----- Waubeek	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
388C----- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
388D----- Seaton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
388E----- Seaton	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
401B----- Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
401C----- Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
401D----- Mt. Carroll	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
455A, 455B----- Festina	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
457E, 457G----- Lacrescent	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
468----- Otter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
474B----- Haverhill	Poor: area reclaim, shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, wetness, too clayey.



TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
476B, 476C----- Frankville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
476D----- Frankville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
477----- Littleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
483----- Waukee	Good-----	Probable-----	Probable-----	Good.
484D----- Eyota	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
488G----- Brodale	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
492B----- Nasset	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim.
492C----- Nasset	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, area reclaim, slope.
493B----- Oronoco	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
501B----- NewGlarus	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
501C----- NewGlarus	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
501D, 501E----- NewGlarus	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
522----- Boots	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: excess humus, wetness.
576, 577----- Newalbin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
578----- Newalbin	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
580B*: Blackhammer-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
580B*: Southridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
580C*: Blackhammer-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Southridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope, thin layer.
580D*: Blackhammer-----	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Southridge-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
584F*: Lamoille-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Dorerton-----	Poor: slope.	Probable-----	Probable-----	Poor: small stones, area reclaim, slope.
586C*: Nodine-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Rollingstone-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
586D*: Nodine-----	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Rollingstone-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
587B----- Palsgrove	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
587C----- Palsgrove	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
587D----- Palsgrove	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
592E*: Lamoille-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Elbaville-----	Poor: slope.	Improbable: large stones.	Improbable: large stones.	Poor: slope, small stones, area reclaim.
598B----- Beavercreek	Fair: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones.
599E----- Norden	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
599F----- Norden	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
604*: Huntsville-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
Beavercreek-----	Fair: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, small stones.
606----- Shiloh	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
815F*: Elbaville-----	Poor: slope.	Improbable: large stones.	Improbable: large stones.	Poor: slope, small stones, area reclaim.
Seaton-----	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
826B*: Gale-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer.
Blackhammer-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
826C*: Gale-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
Blackhammer-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
829C*: Seaton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Gale-----	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, thin layer, slope.
830D*: Eleva-----	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Seaton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
831F*: Spinks-----	Fair: area reclaim, thin layer, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Boone-----	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy, slope.
Sogn-----	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope, thin layer.
832F*, 832G*: Lacrescent-----	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Rock outcrop.				
839*: Urban land.				
Minneopa-----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy, small stones.
840*: Urban land.				
Finchford-----	Good-----	Probable-----	Improbable: too sandy.	Poor: small stones.

See footnote at end of table.



TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
898F*: Bellechester-----	Poor: slope.	Improbable: thin layer.	Improbable: too sandy.	Poor: large stones, area reclaim.
Brodale-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
1002. Fluvaquents				
1010*. Riverwash				
1013*. Pits, quarries				
1015. Psammments				
1016. Udorthents				
1029*. Pits, gravel				
1822B----- Abscota Variant	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
1830, 1857----- Eitzen	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
1860----- Comfrey	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1861----- Chaseburg	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.
1893B----- Beavercreek Variant	Good-----	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
1936----- Hoopeston	Fair: area reclaim, thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
1937----- Lawler	Fair: area reclaim, shrink-swell, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, thin layer.
1951A, 1951B----- Flagler	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
1952B----- Keltner	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1952C----- Keltner	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer, slope.
1953----- Marshan	Fair: wetness.	Probable-----	Improbable: too sandy.	Fair: small stones, thin layer.
1954B, 1954C----- Spinks	Fair: area reclaim, thin layer.	Improbable: thin layer.	Improbable: too sandy.	Poor: too sandy.
1955A, 1955B----- Waukee	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
1960B----- Haverhill Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1990----- Otter	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the "Glossary." See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
11B----- Sogn	Severe: depth to rock, seepage.	Severe: thin layer.	Deep to water	Slope, thin layer.	Depth to rock	Depth to rock.
11D----- Sogn	Severe: depth to rock, slope, seepage.	Severe: thin layer.	Deep to water	Slope, thin layer.	Slope, depth to rock.	Slope, depth to rock.
19----- Chaseburg	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-----	Erodes easily	Erodes easily.
24----- Kasson	Slight-----	Severe: piping.	Frost action--	Wetness, rooting depth.	Wetness-----	Rooting depth.
25----- Becker	Severe: seepage.	Severe: seepage, piping.	Deep to water	Soil blowing---	Too sandy, soil blowing.	Favorable.
79B----- Billett	Severe: seepage.	Severe: piping.	Deep to water	Slope, droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
81B----- Boone	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Area reclaim, too sandy.	Droughty, area reclaim.
81C----- Boone	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.
95C----- Dunbarton	Severe: depth to rock, seepage, slope.	Severe: hard to pack, thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, depth to rock.	Slope, erodes easily, depth to rock.
99B----- Racine	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Favorable-----	Favorable.
99C----- Racine	Severe: slope.	Moderate: piping.	Deep to water	Slope-----	Slope-----	Slope.
103A----- Seaton	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
103B----- Seaton	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
103C, 103D----- Seaton	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
173F----- Frontenac	Severe: seepage, slope.	Moderate: seepage, piping, large stones.	Deep to water	Slope-----	Slope, large stones.	Large stones, slope.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
174D----- Gale	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
176----- Garwin	Moderate: seepage.	Severe: wetness.	Frost action--	Wetness-----	Wetness-----	Wetness.
194----- Huntsville	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
198C----- Rollingstone	Moderate: slope.	Severe: hard to pack.	Deep to water	Slope, large stones, percs slowly.	Large stones, erodes easily.	Large stones, erodes easily.
198D----- Rollingstone	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, large stones, percs slowly.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
215B----- Southridge	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
215C, 215D----- Southridge	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
262B----- Medary	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
271----- Minneiska	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, flooding.	Too sandy, soil blowing.	Favorable.
283B----- Plainfield	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
283C, 283D, 283F-- Plainfield	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
285A----- Port Byron	Moderate: seepage.	Moderate: piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
285B----- Port Byron	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
285C----- Port Byron	Severe: slope.	Moderate: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
299B----- Rockton	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Thin layer, slope.	Area reclaim--	Area reclaim.
301A----- Lindstrom	Moderate: seepage.	Severe: piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
301C, 301D----- Lindstrom	Severe: slope.	Severe: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.



TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
322C2, 322D2, 322E2, 322F----- Timula	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
331----- Tripoli	Moderate: seepage.	Severe: wetness.	Frost action--	Wetness-----	Wetness-----	Wetness.
369B----- Waubeeek	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
369C----- Waubeeek	Severe: slope.	Moderate: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
388C, 388D, 388E-- Seaton	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
401B----- Mt. Carroll	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
401C, 401D----- Mt. Carroll	Severe: slope.	Moderate: piping.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
455A----- Festina	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
455B----- Festina	Moderate: seepage, slope.	Moderate: thin layer, piping.	Deep to water	Slope-----	Erodes easily	Erodes easily.
457E----- Lacrescent	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
457G----- Lacrescent	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Deep to water	Large stones, slope.	Slope, large stones.	Large stones, slope.
468----- Otter	Moderate: seepage.	Severe: piping, wetness.	Frost action--	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.
474B----- Haverhill	Moderate: seepage, slope.	Severe: hard to pack, wetness.	Percs slowly, thin layer, frost action.	Slope, wetness, percs slowly.	Large stones, area reclaim.	Large stones, wetness.
476B----- Frankville	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, thin layer.	Depth to rock, area reclaim.	Erodes easily, depth to rock.
476C, 476D----- Frankville	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly, thin layer.	Slope, depth to rock, area reclaim.	Slope, erodes easily, depth to rock.
477----- Littleton	Moderate: seepage.	Severe: wetness, piping.	Frost action--	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
483----- Waukee	Severe: seepage.	Severe: seepage.	Deep to water	Favorable-----	Too sandy-----	Favorable.
484D----- Eyota	Severe: slope, seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, erodes easily, soil blowing.	Slope, erodes easily.
488G----- Brodale	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
492B----- Nasset	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Erodes easily	Erodes easily, percs slowly.
492C----- Nasset	Severe: slope.	Severe: thin layer.	Deep to water	Slope, percs slowly.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
493B----- Oronoco	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
501B----- NewGlarus	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
501C, 501D, 501E-- NewGlarus	Severe: slope.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
522----- Boots	Severe: seepage.	Severe: excess humus, ponding.	Ponding, subsides, frost action.	Ponding, soil blowing.	Ponding, soil blowing.	Wetness.
576, 577----- Newalbin	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, flooding.	Wetness-----	Wetness.
578----- Newalbin	Moderate: seepage.	Severe: piping, ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding-----	Wetness.
580B*: Blackhammer-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Southridge-----	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
580C*, 580D*: Blackhammer-----	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Southridge-----	Severe: slope.	Moderate: hard to pack.	Deep to water	Slope, percs slowly, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
584F*: Lamoille-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Large stones, percs slowly, slope.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Dorerton-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, large stones.	Slope, large stones, too sandy.	Large stones, slope.
586C*, 586D*: Nodine-----	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Rollingstone-----	Severe: slope.	Severe: hard to pack.	Deep to water	Slope, large stones, percs slowly.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
587B----- Palsgrove	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, slope.	Erodes easily	Erodes easily, percs slowly.
587C, 587D----- Palsgrove	Severe: slope.	Severe: thin layer.	Deep to water	Percs slowly, slope.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
592E*: Lamoille-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Large stones, percs slowly, slope.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Elbaville-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope-----	Slope, large stones, too sandy.	Slope, large stones.
598B----- Beavercreek	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Large stones---	Large stones.
599E, 599F----- Norden	Severe: slope.	Severe: seepage, piping.	Deep to water	Slope, thin layer.	Slope, area reclaim, erodes easily.	Slope, area reclaim, erodes easily.
604*: Huntsville-----	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Flooding-----	Favorable-----	Favorable.
Beavercreek-----	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty.	Large stones, erodes easily.	Large stones, erodes easily.
606----- Shiloh	Slight-----	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding-----	Wetness.
815F*: Elbaville-----	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope-----	Slope, large stones, too sandy.	Slope, large stones.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
815F*: Seaton-----	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
826B*: Gale-----	Severe: seepage.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Area reclaim, erodes easily.	Erodes easily, area reclaim.
Blackhammer-----	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
826C*: Gale-----	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
Blackhammer-----	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
829C*: Seaton-----	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Gale-----	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Slope, thin layer, erodes easily.	Slope, area reclaim, erodes easily.	Slope, erodes easily, area reclaim.
830D*: Eleva-----	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Slope, large stones, thin layer.	Slope, large stones, area reclaim.	Large stones, slope, area reclaim.
Seaton-----	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
831F*: Spinks-----	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Boone-----	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, soil blowing.	Slope, area reclaim, too sandy.	Slope, droughty, area reclaim.
Sogn-----	Severe: depth to rock, slope, seepage.	Severe: thin layer.	Deep to water	Slope, thin layer.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
832F*, 832G*: Lacrescent-----	Severe: seepage, slope.	Severe: seepage, piping, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop.						
839*: Urban land.						

See footnote at end of table.



TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
839*: Minneopa-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, soil blowing.	Too sandy, soil blowing.	Droughty.
840*: Urban land.						
Finchford-----	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty-----	Too sandy, soil blowing.	Droughty.
898F*: Bellechester-----	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, large stones, droughty.	Slope, large stones, too sandy.	Large stones, slope, droughty.
Brodale-----	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
1002. Fluvaquents						
1010*. Riverwash						
1013*. Pits, quarries						
1015. Psammments						
1016. Udorthents						
1029*. Pits, gravel						
1822B----- Abscota Variant	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1830, 1857----- Eitzen	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-----	Favorable-----	Favorable.
1860----- Comfrey	Moderate: seepage.	Severe: wetness.	Flooding, frost action.	Wetness, flooding.	Wetness-----	Wetness.
1861----- Chaseburg	Moderate: seepage.	Severe: piping.	Deep to water	Flooding-----	Erodes easily	Erodes easily.
1893B----- Beaver Creek Variant	Severe: seepage.	Moderate: seepage, piping, large stones.	Deep to water	Slope, flooding.	Large stones---	Large stones.
1936----- Hoopston	Severe: seepage.	Severe: piping, wetness.	Frost action---	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1937----- Lawler	Severe: seepage.	Moderate: thin layer, piping, wetness.	Frost action---	Wetness-----	Wetness-----	Favorable.
1951A----- Flagler	Severe: seepage.	Severe: thin layer.	Deep to water	Soil blowing---	Soil blowing---	Favorable.
1951B----- Flagler	Severe: seepage.	Severe: thin layer.	Deep to water	Slope, soil blowing.	Soil blowing---	Favorable.
1952B----- Keltner	Moderate: seepage, depth to rock, slope.	Moderate: thin layer.	Deep to water	Percs slowly, slope.	Erodes easily	Erodes easily, percs slowly.
1952C----- Keltner	Severe: slope.	Moderate: thin layer.	Deep to water	Percs slowly, slope.	Slope, erodes easily.	Slope, erodes easily, percs slowly.
1953----- Marshan	Severe: seepage.	Severe: seepage, piping, wetness.	Frost action, cutbanks cave.	Wetness, percs slowly.	Wetness, too sandy.	Wetness.
1954B----- Spinks	Severe: seepage.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
1954C----- Spinks	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
1955A----- Waukee	Severe: seepage.	Severe: piping.	Deep to water	Favorable-----	Favorable-----	Favorable.
1955B----- Waukee	Severe: seepage.	Severe: piping.	Deep to water	Slope-----	Favorable-----	Favorable.
1960B----- Haverhill Variant	Moderate: slope.	Moderate: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness.	Wetness, percs slowly.	Wetness, percs slowly.
1990----- Otter	Moderate: seepage.	Severe: piping, wetness.	Frost action---	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.

\* See description of the map unit for composition and behavior characteristics of the map unit.

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
11B----- Sogn	0-19 19	Silt loam----- Unweathered bedrock.	CL, SC ---	A-6 ---	0-10 ---	85-100 ---	75-100 ---	65-100 ---	45-95 ---	25-40 ---	11-23 ---
11D----- Sogn	0-15 15	Silt loam----- Unweathered bedrock.	CL, SC ---	A-6 ---	0-10 ---	85-100 ---	75-100 ---	65-100 ---	45-95 ---	25-40 ---	11-23 ---
19----- Chaseburg	0-9 9-60	Silt loam----- Stratified silt loam to very fine sandy loam.	ML, CL-ML ML, CL-ML, CL	A-4 A-4	0 0	100 85-100	100 85-100	90-100 85-100	85-100 85-100	<26 <28	3-7 3-9
24----- Kasson	0-9 9-17 17-60	Silt loam----- Silty clay loam, silt loam. Loam, sandy clay loam.	CL, CL-ML CL CL, ML	A-4, A-6 A-6, A-7 A-6, A-4	0 0 0-5	100 100 95-100	100 95-100 85-95	95-100 90-100 70-90	75-95 75-95 50-80	25-40 35-45 25-40	4-15 15-25 8-18
25----- Becker	0-9 9-36 36-43 43-60	Fine sandy loam Sandy loam, fine sandy loam, loam. Loamy coarse sand, loamy fine sand, gravelly loamy coarse sand. Coarse sand, loamy coarse sand, loamy fine sand.	ML, SM ML, SM SM SM, SP-SM	A-4 A-4 A-2, A-1 A-1, A-2, A-3	0 0 0 0	100 100 95-100 95-100	95-100 85-100 65-100 75-100	75-95 75-95 35-75 35-70	40-55 35-70 15-35 5-15	<25 <25 <20 <20	NP-4 NP-4 NP NP
79B----- Billett	0-9 9-26 26-30 30-60	Fine sandy loam Sandy loam, fine sandy loam. Loamy sand, sandy loam, fine sandy loam. Loamy sand, sand	SM, SM-SC, SC SM-SC, SC SM, SM-SC, SC SM, SM-SC, SW-SM, SP-SM	A-2, A-4 A-2, A-4, A-6 A-2, A-4, A-6 A-2, A-1-b, A-3	0 0-10 0-10 0-10	100 90-100 75-100 80-100	100 90-100 75-100 75-100	85-100 85-100 75-90 40-95	25-50 25-50 20-45 10-30	<25 20-30 15-30 <25	2-10 5-15 3-15 NP-5
81B----- Boone	0-8 8-25 25-60	Loamy fine sand Fine sand, coarse sand, loamy sand. Weathered bedrock	SM, ML, SP-SM SM, SP-SM, SP ---	A-2, A-4, A-1 A-2, A-3, A-1 ---	0 0 ---	75-100 75-100 ---	75-100 75-100 ---	40-90 30-75 ---	10-60 2-35 ---	--- --- ---	NP NP ---
81C----- Boone	0-8 8-24 24-60	Loamy fine sand Fine sand, coarse sand, loamy sand. Weathered bedrock	SM, ML, SP-SM SM, SP-SM, SP ---	A-2, A-4, A-1 A-2, A-3, A-1 ---	0 0 ---	75-100 75-100 ---	75-100 75-100 ---	40-90 30-75 ---	10-60 2-35 ---	--- --- ---	NP NP ---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO							
						4	10	40	200		
	In				Pct					Pct	
95C----- Dunbarton	0-7	Silt loam-----	CL	A-6, A-4	0-7	85-100	80-100	80-100	70-95	25-35	7-15
	7-10	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0-8	70-100	70-100	70-100	70-95	35-60	15-35
	10-18	Clay, silty clay	CH, CL	A-7	0-8	70-100	70-100	70-100	70-95	45-90	25-60
	18	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
99B----- Racine	0-5	Silt loam-----	ML	A-4, A-6	0	95-100	95-100	90-100	55-85	30-40	5-14
	5-13	Silt loam, clay loam, silty clay loam.	CL	A-6	0	95-100	95-100	90-100	55-85	30-40	10-20
	13-49	Clay loam, sandy clay loam, loam.	CL, SC	A-6	2-5	95-100	75-100	65-90	45-65	25-35	10-15
	49-60	Loam-----	ML, CL	A-6	1-5	95-100	90-100	80-95	50-75	25-40	10-20
99C----- Racine	0-8	Silt loam-----	ML	A-4, A-6	0	95-100	95-100	90-100	55-85	30-40	5-14
	8-22	Silt loam, clay loam, silty clay loam.	CL	A-6	0	95-100	95-100	90-100	55-85	30-40	10-20
	22-36	Clay loam, sandy clay loam, loam.	CL, SC	A-6	2-5	95-100	75-100	65-90	45-65	25-35	10-15
	36-60	Loam-----	ML, CL	A-6	1-5	95-100	90-100	80-95	50-75	25-40	10-20
103A----- Seaton	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-45	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	45-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
103B----- Seaton	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-46	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	46-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
103C----- Seaton	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-39	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	39-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
103D----- Seaton	0-7	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	7-53	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	53-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
173F----- Frontenac	0-15	Loam-----	ML, CL	A-4, A-6	0	95-100	85-100	70-100	60-90	30-40	5-15
	15-27	Loam, silt loam	ML	A-4, A-6	0-10	95-100	75-100	70-90	60-85	30-40	5-15
	27-60	Cobbly loam, flaggy loam, channery loam.	SM, GM	A-2	25-50	45-85	35-75	30-55	25-35	30-40	5-10
174D----- Gale	0-10	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	20-30	5-11
	10-31	Silt loam, silty clay loam.	CL	A-6, A-4, A-7	0	100	100	90-100	85-95	25-45	9-20
	31-34	Loam, silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	65-100	50-95	25-40	9-20
	34-37	Sand, loamy sand	SM, SP-SM, SM-SC	A-3, A-2, A-1, A-4	0	85-100	85-100	45-75	5-40	<25	NP-7
	37-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---



TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
176----- Garwin	0-9	Silt loam-----	CL, ML	A-6, A-7	0	100	100	100	95-100	30-45	10-20
	9-39	Silty clay loam	CH, CL	A-7	0	100	100	100	95-100	45-55	25-35
	39-60	Silt loam-----	CL	A-6	0	100	100	100	95-100	30-40	15-20
194----- Huntsville	0-50	Silt loam-----	CL	A-6	0	100	98-100	90-100	85-100	25-40	10-25
	50-60	Silt loam, loam, sandy loam.	CL, ML, SM, SC	A-4, A-6	0	90-100	80-100	55-95	45-85	20-35	NP-15
198C----- Rollingstone	0-7	Silt loam-----	CL, ML, CL-ML	A-4	0-5	95-100	92-100	90-100	90-100	15-25	3-10
	7-15	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0-5	95-100	92-100	90-100	90-100	15-30	3-15
	15-60	Clay, cherty clay	CH, SC, GC	A-7	10-35	60-90	55-85	50-80	40-70	50-70	20-40
198D----- Rollingstone	0-5	Silt loam-----	CL, ML, CL-ML	A-4	0-5	95-100	92-100	90-100	90-100	15-25	3-10
	5-10	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0-5	95-100	92-100	90-100	90-100	15-30	3-15
	10-60	Clay, cherty clay	CH, SC, GC	A-7	10-35	60-90	55-85	50-80	40-70	50-70	20-40
215B----- Southridge	0-8	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	98-100	98-100	15-25	3-10
	8-30	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	15-40	4-20
	30-60	Clay-----	CH	A-7	2-10	75-100	75-90	65-90	60-90	50-70	20-40
215C----- Southridge	0-9	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	98-100	98-100	15-25	3-10
	9-29	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	15-40	4-20
	29-60	Clay-----	CH	A-7	2-10	75-100	75-90	65-90	60-90	50-70	20-40
215D----- Southridge	0-8	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	98-100	98-100	15-25	3-10
	8-28	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	15-40	4-20
	28-60	Clay-----	CH	A-7	2-10	75-100	65-90	65-90	60-90	50-70	20-40
262B----- Medary	0-9	Silt loam-----	CL, CL-ML	A-4	0	100	100	90-100	60-75	20-30	5-10
	9-13	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	60-95	20-40	5-20
	13-56	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-65	23-41
	56-60	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	50-59	30-35
	60-70	Stratified silty clay to silt loam.	CH, MH, CL, ML	A-7, A-6	0	100	100	90-100	75-95	35-55	15-30
271----- Minneiska	0-8	Fine sandy loam	SM	A-4	0	100	95-100	50-70	35-50	<20	NP-4
	8-46	Stratified silt loam to sand.	SM, ML	A-4	0	100	85-100	50-90	35-60	<20	NP-4
	46-60	Loamy sand, sand, fine sand.	SP-SM, SM	A-2, A-3	0	100	85-100	50-75	5-30	<20	NP
283B, 283C----- Plainfield	0-8	Sand-----	SP-SM, SM, SP	A-3, A-2, A-1	0	75-100	75-100	40-80	3-35	---	NP
	8-31	Sand-----	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-70	1-15	---	NP
	31-60	Sand, fine sand, coarse sand.	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-90	1-15	---	NP

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
283D----- Plainfield	0-4	Sand-----	SP-SM, SM, SP	A-3, A-2, A-1	0	75-100	75-100	40-80	3-35	---	NP
	4-31	Sand-----	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-70	1-15	---	NP
	31-60	Sand, fine sand, coarse sand.	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-90	1-15	---	NP
283F----- Plainfield	0-3	Sand-----	SP-SM, SM, SP	A-3, A-2, A-1	0	75-100	75-100	40-80	3-35	---	NP
	3-34	Sand-----	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-70	1-15	---	NP
	34-60	Sand, fine sand, coarse sand.	SP, SM, SP-SM	A-3, A-1, A-2	0	75-100	75-100	40-90	1-15	---	NP
285A----- Port Byron	0-19	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-40	7-18
	19-42	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-40	7-18
	42-60	Silt loam-----	CL	A-4, A-6	0	100	100	100	90-100	25-40	7-17
285B----- Port Byron	0-16	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-40	7-18
	16-42	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-40	7-18
	42-60	Silt loam-----	CL	A-4, A-6	0	100	100	100	90-100	25-40	7-17
285C----- Port Byron	0-13	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-40	7-18
	13-50	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-40	7-18
	50-60	Silt loam-----	CL	A-4, A-6	0	100	100	100	90-100	25-40	7-17
299B----- Rockton	0-9	Silt loam-----	ML, CL-ML, CL	A-4	0	90-100	90-100	85-95	50-75	25-35	5-10
	9-22	Loam, sandy clay loam, clay loam.	CL, SC	A-6, A-7	0	90-100	90-100	75-90	45-70	30-45	10-20
	22-27	Clay, clay loam, silty clay.	CH, CL	A-7	0-2	90-100	90-100	90-95	70-90	40-60	20-35
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
301A----- Lindstrom	0-9	Silt loam-----	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	9-36	Silt loam, loam	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	36-60	Silt loam-----	ML, CL	A-4, A-6	0	100	100	95-100	85-95	30-40	9-14
301C----- Lindstrom	0-9	Silt loam-----	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	9-35	Silt loam, loam	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	35-60	Silt loam-----	ML, CL	A-4, A-6	0	100	100	95-100	85-95	30-40	9-14
301D----- Lindstrom	0-9	Silt loam-----	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	9-27	Silt loam, loam	ML	A-4	0	100	100	95-100	85-95	30-40	5-10
	27-60	Silt loam-----	ML, CL	A-4, A-6	0	100	100	95-100	85-95	30-40	9-14
322C2----- Timula	0-24	Silt loam-----	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
	24-60	Silt loam, silt	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
322D2----- Timula	0-30	Silt loam-----	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
	30-60	Silt loam, silt	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
322E2----- Timula	0-32	Silt loam-----	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
	32-60	Silt loam, silt	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
322F----- Timula	0-24	Silt loam-----	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
	24-60	Silt loam, silt	ML, CL-ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
331----- Tripoli	0-16	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	65-85	35-45	15-25
	16-26	Clay loam, loam	CL	A-6	2-5	90-95	85-90	75-85	55-65	30-40	11-20
	26-60	Loam, sandy clay loam, clay loam.	CL, SC	A-6	2-5	90-95	85-90	75-85	45-65	30-40	11-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
369B----- Waubeek	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	100	25-35	5-15
	9-26	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	100	40-50	15-25
	26-60	Loam, sandy clay loam, clay loam.	CL	A-6	0-5	90-95	85-95	75-85	50-65	25-35	10-20
369C----- Waubeek	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	100	25-35	5-15
	8-32	Silty clay loam, silt loam.	CL	A-7	0	100	100	100	100	40-50	15-25
	32-60	Loam, sandy clay loam, clay loam.	CL	A-6	0-5	90-95	85-95	75-85	50-65	25-35	10-20
388C----- Seaton	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-46	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	46-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
388D----- Seaton	0-9	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	9-50	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	50-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
388E----- Seaton	0-6	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	6-35	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	35-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
401B----- Mt. Carroll	0-8	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-36	7-18
	8-54	Silt loam-----	CL	A-6, A-4	0	100	100	100	95-100	27-40	8-20
	54-60	Silt loam-----	CL	A-4, A-6	0	100	100	100	90-100	26-37	7-17
401C----- Mt. Carroll	0-8	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-36	7-18
	8-40	Silt loam-----	CL	A-6, A-4	0	100	100	100	95-100	27-40	8-20
	40-60	Silt loam-----	CL	A-4, A-6	0	100	100	100	90-100	26-37	7-17
401D----- Mt. Carroll	0-7	Silt loam-----	CL	A-4, A-6	0	100	100	100	95-100	25-36	7-18
	7-55	Silt loam-----	CL	A-6, A-4	0	100	100	100	95-100	27-40	8-20
	55-60	Silt loam-----	CL	A-4, A-6	0	100	100	100	90-100	26-37	7-17
455A----- Festina	0-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	11-53	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
	53-60	Silt loam-----	CL	A-6	0	100	100	100	95-100	30-40	10-20
455B----- Festina	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-48	Silt loam, silty clay loam.	CL	A-6	0	100	100	100	95-100	30-40	10-20
	48-60	Silt loam-----	CL	A-6	0	100	100	100	95-100	30-40	10-20
457E----- Lacrescent	0-8	Channery silt loam.	CL, ML	A-6, A-7	15-30	80-100	70-100	60-95	50-90	30-45	10-20
	8-15	Cobbly silt loam, cobbly fine sandy loam, very cobbly loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	30-55	55-80	45-80	40-65	20-60	20-35	3-12
	15-48	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	50-65	50-75	40-65	35-60	15-55	<30	NP-12

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
457G----- Lacrescent	0-10	Silt loam-----	CL, ML	A-6	0-15	90-100	80-100	60-95	50-90	30-40	10-15
	10-32	Cobbly silt loam, cobbly fine sandy loam, very cobbly loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	30-55	55-80	45-80	40-65	20-60	20-35	3-12
	32-60	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	50-65	50-75	40-65	35-60	15-55	<30	NP-12
468----- Otter	0-28	Silt loam-----	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	25-45	7-20
	28-60	Silt loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	10-20
474B----- Haverhill	0-4	Mucky silty clay loam.	CL, CH	A-7, A-6	0-2	90-100	85-100	80-100	75-95	35-60	15-30
	4-30	Clay, silty clay, channery clay.	CL, CH	A-7	5-25	75-95	70-90	65-90	60-85	40-70	20-45
	30-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
476B----- Frankville	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	7-24	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	24-38	Clay, silty clay	CH	A-7	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
476C----- Frankville	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-26	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	26-36	Clay, silty clay	CH	A-7	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
476D----- Frankville	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	7-25	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	25-35	Clay, silty clay	CH	A-7	2-10	85-95	80-90	70-85	65-80	50-70	30-45
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
477----- Littleton	0-8	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	25-40	7-20
	8-35	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	25-40	7-20
	35-60	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	100	100	95-100	80-100	20-45	5-20
483----- Waukee	0-21	Loam-----	CL	A-6	0	100	90-100	70-90	50-75	30-40	10-20
	21-36	Loam, sandy clay loam.	CL, SM-SC, SC, CL-ML	A-6, A-4	0-5	85-95	80-95	65-85	40-60	20-35	5-15
	36-60	Gravelly sand, loamy coarse sand, sand.	SW, SM, SP-SM, SP	A-1	2-10	60-90	60-85	20-40	3-25	---	NP



TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
484D----- Eyota	0-20	Fine sandy loam	SM, SM-SC	A-4	0	90-100	85-100	60-90	35-50	<20	NP-5
	20-26	Loam, sandy loam, fine sandy loam.	SM, ML, CL-ML, SM-SC	A-4	0	90-100	85-100	60-90	35-70	<20	NP-5
	26-48	Silt loam, loam	CL, CL-ML	A-4	0	95-100	90-100	80-100	60-100	20-30	5-10
	48-60	Fine sandy loam, loamy sand, sand.	ML, SM, CL-ML, SM-SC	A-4, A-2	0	95-100	85-100	50-90	15-70	<20	NP-5
488G----- Brodale	0-7	Cobbly loam-----	SM, SP-SM, SC, GC	A-2, A-1	7-30	30-65	20-55	15-45	8-35	<25	NP-8
	7-60	Very flaggy very fine sandy loam, flaggy silt loam, cobbly sandy loam.	SM, SC, SM-SC, GM	A-2, A-1	20-50	45-80	40-75	25-50	10-35	<25	NP-8
492B----- Nasset	0-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	11-37	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	37-60	Clay, silty clay	CH	A-7	2-10	85-95	80-90	70-85	65-85	50-70	30-45
492C----- Nasset	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	9-45	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	100	95-100	35-45	15-25
	45-60	Clay, silty clay	CH	A-7	2-10	85-95	80-90	70-85	65-85	50-70	30-45
493B----- Oronoco	0-8	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	100	95-100	35-60	15-30	3-10
	8-53	Fine sandy loam, loam.	ML, CL-ML, SM, SM-SC	A-4	0	100	100	95-100	35-80	15-25	3-10
	53-60	Silt loam-----	ML	A-4	0	100	100	95-100	85-100	25-35	NP-10
501B----- NewGlarus	0-13	Silt loam-----	CL	A-6, A-7	0	100	100	90-100	80-90	25-45	10-25
	13-28	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-95	30-50	10-30
	28-39	Clay, silty clay	CH, CL	A-7	0-10	85-100	85-100	80-100	65-100	45-90	25-60
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
501C----- NewGlarus	0-8	Silt loam-----	CL	A-6, A-7	0	100	100	90-100	80-90	25-45	10-25
	8-23	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-95	30-50	10-30
	23-37	Clay, silty clay	CH, CL	A-7	0-10	85-100	85-100	80-100	65-100	45-90	25-60
	37	Weathered bedrock	---	---	---	---	---	---	---	---	---
501D----- NewGlarus	0-12	Silt loam-----	CL	A-6, A-7	0	100	100	90-100	80-90	25-45	10-25
	12-26	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-95	30-50	10-30
	26-36	Clay, silty clay	CH, CL	A-7	0-10	85-100	85-100	80-100	65-100	45-90	25-60
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
501E----- NewGlarus	0-3	Silt loam-----	CL	A-6, A-7	0	100	100	90-100	80-90	25-45	10-25
	3-24	Silty clay loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	90-100	85-95	30-50	10-30
	24-34	Clay, silty clay	CH, CL	A-7	0-10	85-100	85-100	80-100	65-100	45-90	25-60
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
522----- Boots	0-8	Sapric material	PT	A-8	0	---	---	---	---	---	---
	8-60	Hemic material---	PT	A-8	0	---	---	---	---	---	---

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
576----- Newalbin	0-7	Silt loam-----	CL, CL-ML	A-4	0	100	100	90-100	85-98	20-30	4-10
	7-28	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4	0	100	100	90-100	85-98	20-30	4-10
	28-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	80-98	25-45	4-20
577----- Newalbin	0-7	Silt loam-----	CL, CL-ML	A-4	0	100	100	90-100	85-98	20-30	4-10
	7-34	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4	0	100	100	90-100	85-98	20-30	4-10
	34-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	80-98	25-45	4-20
578----- Newalbin	0-10	Silt loam-----	CL, CL-ML	A-4	0	100	100	90-100	85-98	20-30	4-10
	10-30	Silt loam, loam, very fine sandy loam.	CL, CL-ML	A-4	0	100	100	90-100	85-98	20-30	4-10
	30-60	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6, A-7	0	100	100	85-100	80-98	25-45	4-20
580B*: Blackhammer-----	0-8	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	80-95	18-40	3-15
	8-22	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	80-90	25-50	7-25
	22-60	Stratified sandy loam to gravelly sandy clay.	CL, SC, SM-SC	A-4, A-2, A-7, A-6	5-20	75-95	65-95	60-90	30-70	25-50	7-25
Southridge-----	0-8	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	98-100	98-100	15-25	3-10
	8-28	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	15-40	4-20
	28-60	Clay-----	CH	A-7	2-10	75-100	65-90	65-90	60-90	50-70	20-40
580C*: Blackhammer-----	0-9	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	80-95	18-40	3-15
	9-26	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	80-90	25-50	7-25
	26-60	Stratified sandy loam to gravelly sandy clay.	CL, SC, SM-SC	A-4, A-2, A-7, A-6	5-20	75-95	65-95	60-90	30-70	25-50	7-25
Southridge-----	0-9	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	98-100	98-100	15-25	3-10
	9-29	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	15-40	4-20
	29-60	Clay-----	CH	A-7	2-10	75-100	65-90	65-90	60-90	50-70	20-40
580D*: Blackhammer-----	0-8	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	80-95	18-40	3-15
	8-25	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	80-90	25-50	7-25
	25-60	Stratified sandy loam to gravelly sandy clay.	CL, SC, SM-SC	A-4, A-2, A-7, A-6	5-20	75-95	75-95	60-90	30-70	25-50	7-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct						
580D*: Southridge-----	0-8	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	98-100	98-100	15-25	3-10
	8-25	Silt loam-----	ML, CL, CL-ML	A-4, A-6	0	100	100	95-100	95-100	15-40	4-20
	25-60	Clay-----	CH	A-7	2-10	75-100	75-90	65-90	60-90	50-70	20-40
584F*: Lamoille-----	0-12	Silt loam-----	CL, CL-ML	A-6, A-4	0-2	95-100	90-100	90-100	80-100	18-35	4-15
	12-28	Clay, clay loam, gravelly clay.	GC, SC, CL, CH	A-7	5-25	65-95	55-85	50-80	40-70	40-65	15-40
	28-42	Cobbly loam, cobbly clay loam, very cobbly clay loam.	GC, SC	A-6, A-7, A-2	10-50	30-75	25-65	15-55	12-45	35-60	15-35
	42-60	Cobbly loam, cobbly sandy loam, very cobbly loam.	GC, GM	A-2, A-1, A-4	45-60	25-60	20-55	15-50	12-40	18-30	4-10
Dorerton-----	0-8	Silt loam-----	ML	A-4	0	100	100	70-95	55-90	20-30	NP-5
	8-12	Loam, clay loam, silt loam.	CL, ML	A-4, A-6	0-5	95-100	85-100	70-95	50-85	30-40	5-15
	12-24	Channery loam, very channery clay loam, very channery loam.	GM, GC, SM, SC	A-2, A-1	20-55	40-75	30-65	20-45	12-35	30-45	5-20
	24-60	Very channery loamy sand, very flaggy loamy sand, flaggy loam.	GW-GM, SP-SM, SM, GM	A-1, A-2	20-55	40-75	30-65	15-40	5-30	<20	NP
586C*: Nodine-----	0-7	Silt loam-----	CL, ML	A-4, A-6	0-5	95-100	92-100	90-100	90-100	20-35	3-15
	7-15	Silt loam-----	CL, CL-ML	A-4, A-6	0-10	95-100	92-100	90-100	90-100	25-40	5-15
	15-60	Stratified loamy sand to clay.	CL, SC, SM-SC, CL-ML	A-7, A-6, A-4, A-2	5-30	75-95	75-95	60-90	30-70	25-50	5-25
Rollingstone----	0-7	Silt loam-----	CL, ML, CL-ML	A-4	0-5	95-100	92-100	90-100	90-100	15-25	3-10
	7-15	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0-5	95-100	92-100	90-100	90-100	15-30	3-15
	15-60	Clay, cherty clay	CH, SC, GC	A-7	10-35	60-90	55-85	50-80	40-70	50-70	20-40
586D*: Nodine-----	0-6	Silt loam-----	CL, ML	A-4, A-6	0-5	95-100	92-100	90-100	90-100	20-35	3-15
	6-16	Silt loam-----	CL, CL-ML	A-4, A-6	0-10	95-100	92-100	90-100	90-100	25-40	5-15
	16-60	Stratified loamy sand to clay.	CL, SC, SM-SC, CL-ML	A-7, A-6, A-4, A-2	5-30	75-95	75-95	60-90	30-70	25-50	5-25
Rollingstone----	0-5	Silt loam-----	CL, ML, CL-ML	A-4	0-5	95-100	92-100	90-100	90-100	15-25	3-10
	5-10	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0-5	95-100	92-100	90-100	90-100	15-30	3-15
	10-60	Clay, cherty clay	CH, SC, GC	A-7	10-35	60-90	55-85	50-80	40-70	50-70	20-40

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
587B----- Palsgrove	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	23-35	5-14
	7-37	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	36-46	17-27
	37-52	Clay, silty clay loam, silty clay.	CH	A-7	0-5	90-95	90-95	80-95	65-90	55-75	30-45
	52	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
587C----- Palsgrove	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	23-35	5-14
	9-41	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	36-46	17-27
	41-52	Clay, silty clay loam, silty clay.	CH	A-7	0-5	90-95	90-95	80-95	65-90	55-75	30-45
	52	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
587D----- Palsgrove	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	23-35	5-14
	9-40	Silty clay loam, silt loam.	CL	A-7, A-6	0	100	100	100	95-100	36-46	17-27
	40-48	Clay, silty clay loam, silty clay.	CH	A-7	0-5	90-95	90-95	80-95	65-90	55-75	30-45
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
592E*: Lamoille-----	0-15	Silt loam-----	CL, CL-ML	A-6, A-4	0-2	95-100	90-100	90-100	80-100	18-35	4-15
	15-28	Clay, clay loam, gravelly clay.	GC, SC, CL, CH	A-7	5-25	65-95	55-85	50-80	40-70	40-65	15-40
	28-44	Cobbly loam, cobbly clay loam, very cobbly clay loam.	GC, SC	A-6, A-7, A-2	10-50	30-75	25-65	15-55	12-45	35-60	15-35
	44-60	Cobbly loam, cobbly sandy loam, very cobbly loam.	GC, GM	A-2, A-1, A-4	45-60	25-60	20-55	15-50	12-40	18-30	4-10
Elbaville-----	0-9	Silt loam-----	ML, CL-ML, CL	A-4	0	100	100	90-100	50-90	20-30	3-8
	9-22	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	95-100	80-95	30-45	8-20
	22-36	Silty clay, silty clay loam, clay.	CL, CH, MH, ML	A-7	0-20	90-100	80-100	75-100	70-95	40-65	20-32
	36-60	Flaggy loamy sand, flaggy sandy loam, flaggy sand.	GM, SM, GP-GM, SP-SM	A-2, A-1	20-70	35-75	30-70	15-50	10-30	<20	NP-4
598B----- Beavercreek	0-8	Silt loam-----	ML, CL-ML	A-4	0-5	90-100	75-100	65-90	50-85	25-40	4-10
	8-60	Stratified very cobbly silt loam to very cobbly sand.	GM, SM	A-1, A-2	30-60	45-80	40-70	25-50	10-30	20-35	NP-10

See footnote at end of table.



TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
599E----- Norden	0-6	Silt loam-----	ML, CL, SM, SC	A-4, A-6	0	75-100	70-100	60-100	40-90	20-30	3-12
	6-15	Loam, silt loam, silty clay loam.	CL, SC	A-6	0	75-100	70-100	60-100	40-95	25-40	10-25
	15-42	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-2	0	75-100	70-100	55-100	25-85	25-40	10-25
	42-60	Sandy loam, sandy clay loam, loamy fine sand.	SM, SC, ML, CL	A-2, A-4, A-1, A-6	0-3	75-100	70-100	35-95	15-55	<35	NP-15
599F----- Norden	0-6	Silt loam-----	ML, CL, SM, SC	A-4, A-6	0	75-100	70-100	60-100	40-90	20-30	3-12
	6-15	Loam, silt loam, silty clay loam.	CL, SC	A-6	0	75-100	70-100	60-100	40-95	25-40	10-25
	15-29	Loam, clay loam, sandy clay loam.	CL, SC	A-6, A-2	0	75-100	70-100	55-100	25-85	25-40	10-25
	29-60	Unweathered bedrock, weathered bedrock.	---	---	---	---	---	---	---	---	---
604*: Huntsville-----	0-46	Silt loam-----	CL	A-6	0	100	98-100	90-100	85-100	25-40	10-25
	46-60	Silt loam, loam, sandy loam.	CL, ML, SM, SC	A-4, A-6	0	90-100	80-100	55-95	45-85	20-35	NP-15
Beavercreek-----	0-10	Cobbly fine sandy loam.	SM	A-2, A-4	1-25	70-100	50-75	35-70	25-50	20-35	NP-10
	10-60	Stratified very cobbly silt loam to very cobbly sand.	GM, SM	A-1, A-2	30-60	45-80	40-70	25-50	10-30	20-35	NP-10
606----- Shiloh	0-12	Silt loam-----	CL	A-6	0	100	100	95-100	90-100	25-40	10-20
	12-60	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	40-65	15-40
815F*: Elbaville-----	0-15	Silt loam-----	ML, CL-ML, CL	A-4	0	100	100	90-100	50-90	20-30	3-8
	15-26	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	100	95-100	80-95	30-45	8-20
	26-35	Silty clay, silty clay loam, clay.	CL, CH, MH, ML	A-7	0-20	90-100	80-100	75-100	70-95	40-65	20-32
	35-52	Flaggy silty clay loam, flaggy silt loam.	GC, GM, SC, SM	A-2, A-4, A-6, A-7	20-70	35-75	30-70	25-65	20-50	30-45	5-20
	52-60	Flaggy loamy sand, flaggy sandy loam, flaggy sand.	GM, SM, GP-GM, SP-SM	A-2, A-1	20-70	35-75	30-70	15-50	10-30	<20	NP-4
Seaton-----	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-48	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	48-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
826B*: Gale-----	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	20-30	5-11
	9-30	Silt loam, silty clay loam.	CL	A-6, A-4, A-7	0	100	100	90-100	85-95	25-45	9-20
	30-36	Sand, loamy sand	SM, SP-SM, SM-SC	A-3, A-2, A-1, A-4	0	85-100	85-100	45-75	5-40	<25	NP-7
	36-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Blackhammer-----	0-7	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	80-95	18-40	3-15
	7-27	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	80-90	25-50	7-25
	27-60	Stratified sandy loam to gravelly sandy clay.	CL, SC, SM-SC	A-4, A-2, A-7, A-6	5-20	75-95	65-95	60-90	30-70	25-50	7-25
826C*: Gale-----	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	20-30	5-11
	8-32	Silt loam, silty clay loam.	CL	A-6, A-4, A-7	0	100	100	90-100	85-95	25-45	9-20
	32-38	Sand, loamy sand	SM, SP-SM, SM-SC	A-3, A-2, A-1, A-4	0	85-100	85-100	45-75	5-40	<25	NP-7
	38-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Blackhammer-----	0-9	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	85-100	80-95	18-40	3-15
	9-26	Silt loam-----	CL-ML, CL	A-4, A-6, A-7	0	100	100	85-100	80-90	25-50	7-25
	26-60	Stratified sandy loam to gravelly sandy clay.	CL, SC, SM-SC	A-4, A-2, A-7, A-6	5-20	75-95	65-95	60-90	30-70	25-50	7-25
829C*: Seaton-----	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-43	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
	43-60	Silt loam, silt	CL, CL-ML	A-4, A-6	0	100	100	100	90-100	25-40	5-20
Gale-----	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	85-95	20-30	5-11
	8-32	Silt loam, silty clay loam.	CL	A-6, A-4, A-7	0	100	100	90-100	85-95	25-45	9-20
	32-36	Loam, silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	65-100	50-95	25-40	9-20
	36-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
830D*: Eleva-----	0-5	Cobbly silt loam	ML, CL, SM, SC	A-4, A-6	15-45	95-100	95-100	95-100	35-90	20-30	3-12
	5-9	Cobbly sandy loam, cobbly loam, cobbly fine sandy loam.	ML, CL, SM, SC	A-4, A-6	15-45	95-100	95-100	95-100	35-90	20-30	3-12
	9-22	Cobbly fine sandy loam, cobbly loam, cobbly sandy loam.	SM, SM-SC, ML, CL-ML	A-2-4, A-4	15-45	95-100	95-100	95-100	30-55	<25	2-6
	22-26	Channery loamy fine sand, channery fine sand.	SM, SP-SM	A-2-4	10-35	85-100	85-100	85-100	10-35	<20	NP-2
	26-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Seaton-----	0-8	Silt loam-----	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	100	95-100	20-45	5-20
	8-60	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	100	90-100	25-40	5-20
831F*: Spinks-----	0-3	Loamy fine sand	SM, SP-SM	A-2-4, A-1-b	0	95-100	80-100	35-80	10-35	<20	NP-4
	3-28	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM	A-2-4, A-1-b	0	95-100	80-100	35-80	10-35	<20	NP-3
	28-43	Stratified sandy loam to sand.	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	50-80	5-35	<25	NP-6
	43	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
Boone-----	0-7	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4, A-2	0	75-100	75-100	55-85	30-55	<23	NP-6
	7-13	Fine sand, coarse sand, loamy sand.	SM, SP-SM, SP	A-2, A-3, A-1	0	75-100	75-100	30-75	2-35	---	NP
	13-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sogn-----	0-20	Flaggy silt loam	CL, SC	A-6, A-7	10-20	85-100	70-95	60-90	45-85	25-45	10-25
	20	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
832F*: Lacrescent-----	0-13	Cobbly loam-----	CL, ML	A-6, A-7	15-30	80-100	70-100	60-95	50-90	30-45	10-20
	13-28	Cobbly silt loam, cobbly fine sandy loam, very cobbly loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	30-55	55-80	45-80	40-65	20-60	20-35	3-12
	28-60	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	50-65	50-75	40-65	35-60	15-55	<30	NP-12
Rock outcrop.											

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
832G*: Lacrescent-----	0-14	Cobbly loam-----	CL, ML	A-6, A-7	15-30	80-100	70-100	60-95	50-90	30-45	10-20
	14-60	Extremely cobbly loam, very cobbly silt loam, very cobbly fine sandy loam.	SM, SC, ML, CL	A-4, A-6, A-2, A-1	50-65	50-75	40-65	35-60	15-55	<30	NP-12
Rock outcrop.											
839*: Urban land.											
Minneopa-----	0-16	Sandy loam-----	SM	A-2, A-4	0	100	85-100	60-70	30-40	---	NP
	16-24	Sandy loam, loamy sand, coarse sandy loam.	SM	A-2, A-1	0	80-100	50-100	30-70	15-30	---	NP
	24-60	Loamy sand, sand, gravelly coarse sand.	SM, SP-SM	A-2, A-3, A-1	0	80-100	50-100	25-75	5-15	---	NP
840*: Urban land.											
Finchford-----	0-8	Sandy loam-----	SP-SM, SM	A-2, A-3	0	85-95	70-90	50-60	5-15	---	NP
	8-33	Sand, loamy sand, gravelly sand.	SW-SM, SP-SM	A-1	0	80-90	50-75	25-40	5-10	---	NP
	33-60	Gravelly sand, gravelly coarse sand, sand.	SW, SW-SM, SP, SP-SM	A-1	0	75-95	50-95	20-35	3-5	---	NP
898F*: Bellechester----	0-22	Loamy fine sand	SP-SM, SM	A-3, A-2	0-10	90-100	85-100	70-90	5-15	<20	NP
	22-54	Sand, fine sand, loamy fine sand.	SP, SP-SM	A-3, A-2	0-45	85-100	70-100	50-90	3-10	<20	NP
	54-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
Brodale-----	0-10	Flaggy loam-----	SM, SP-SM, SC, GM	A-2, A-1	7-30	30-65	20-55	15-45	8-35	<25	NP-8
	10-34	Very flaggy very fine sandy loam, flaggy silt loam, cobbly sandy loam.	SM, SC, SM-SC, GM	A-2, A-1	20-50	45-80	40-75	25-50	10-35	<25	NP-8
	34-38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
1002. Fluvaquents											
1010*. Riverwash											
1013*. Pits, quarries											
1015. Psamments											

See footnote at end of table.



TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1016. Udorthents											
1029*. Pits, gravel											
1822B----- Abscota Variant	0-50	Sand-----	SM, SP-SM	A-3, A-2-4	0	95-100	90-100	50-70	5-20	<20	NP-4
	50-60	Stratified sand to silt loam.	SM, SP-SM	A-2-4, A-4	0	95-100	90-100	50-75	10-30	<20	NP-4
1830, 1857----- Eitzen	0-28	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	98-100	92-100	75-100	25-40	5-18
	28-47	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	98-100	92-100	85-95	25-40	5-20
	47-60	Silt loam, loam	CL, CL-ML	A-6, A-4	0	100	90-100	85-100	80-95	25-40	5-20
1860----- Comfrey	0-12	Silt loam-----	ML, OL, CL	A-6, A-4	0	100	100	85-100	55-90	30-40	5-15
	12-60	Clay loam, loam	OL, OH, MH, ML	A-7	0	100	100	85-100	65-85	45-60	12-25
1861----- Chaseburg	0-7	Silt loam-----	ML, CL-ML	A-4	0	100	100	90-100	85-100	<26	3-7
	7-60	Stratified silt loam to very fine sandy loam.	ML, CL-ML, CL	A-4	0	85-100	85-100	85-100	85-100	<28	3-9
1893B----- Beaver Creek Variant	0-19	Loam-----	SM, ML, CL-ML, SM-SC	A-4	0-8	60-80	55-85	45-70	35-60	20-35	2-10
	19-32	Loam, fine sandy loam.	SM, ML, CL-ML, SM-SC	A-4, A-2-4	0-15	60-80	55-85	45-70	30-60	20-35	2-10
	32-60	Cobbly fine sandy loam, cobbly loam, cobbly sandy loam.	SM, SC, GM, GC	A-2-4, A-4, A-1-b	25-40	60-75	55-70	35-65	20-45	15-25	2-10
1936----- Hoopeston	0-13	Sandy loam-----	SM, SC, SM-SC	A-4	0	100	100	60-95	35-45	<30	5-10
	13-30	Sandy loam-----	SM, SC, SM-SC	A-2-4, A-4	0	100	100	60-85	25-50	<30	5-10
	30-40	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	50-80	5-20	<25	NP-4
	40-45	Stratified sand to clay.	SP-SM, SM, CL, ML	A-2, A-3, A-6, A-7	0	95-100	95-100	65-100	5-70	<70	NP-50
	45-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
1937----- Lawler	0-12	Loam-----	CL	A-6	0	100	100	70-90	55-75	25-40	10-20
	12-35	Loam-----	CL	A-6	0	95-100	95-100	70-85	50-65	25-35	10-17
	35-52	Loamy sand, sand, fine sand.	SM, SP-SM	A-2, A-3	0-2	90-100	70-100	50-75	5-35	<15	NP-3
	52	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1951A----- Flagler	0-14	Sandy loam-----	SC, SM-SC, CL, CL-ML	A-2, A-4	0	100	100	60-85	30-65	20-30	4-10
	14-28	Sandy loam-----	SC, SM-SC	A-2, A-4	0	100	100	60-75	25-40	<25	4-10
	28-40	Loamy sand, loamy fine sand.	SP-SM, SM	A-2, A-3, A-1	0	85-100	75-100	35-70	5-25	<20	NP-4
	40-49	Loamy sand, gravelly sandy loam, loamy fine sand.	SM, SC, SM-SC	A-2, A-4	0	80-100	70-100	50-80	20-40	<25	2-10
	49-51	Loam, clay loam, clay.	CL, CH	A-6, A-7	0	100	95-100	85-95	55-90	25-70	10-45
	51-60	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
1951B----- Flagler	0-8	Sandy loam-----	SC, SM-SC, CL, CL-ML	A-2, A-4	0	100	100	60-85	30-65	20-30	4-10
	8-11	Sandy loam-----	SC, SM-SC	A-2, A-4	0	100	100	60-75	25-40	<25	4-10
	11-34	Loamy sand, loamy fine sand.	SP-SM, SM	A-2, A-3, A-1	0	85-100	75-100	35-70	5-25	<20	NP-4
	34-52	Loam, clay loam, clay.	CL, CH	A-6, A-7	0	100	95-100	85-95	55-90	25-70	10-45
	52	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
1952B----- Keltner	0-13	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	30-40	8-15
	13-28	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	90-100	35-45	15-25
	28-51	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	85-100	75-95	30-55	15-35
	51-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
1952C----- Keltner	0-16	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	30-40	8-15
	16-27	Silty clay loam	CL	A-7, A-6	0	100	100	95-100	90-100	35-45	15-25
	27-47	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	85-100	75-95	30-55	15-35
	47-60	Weathered bedrock	---	---	---	---	---	---	---	---	---
1953----- Marshan	0-17	Silt loam-----	CL, ML	A-4, A-6	0	100	95-100	95-100	60-90	30-40	5-15
	17-36	Loam, silt loam, clay loam.	CL	A-7, A-6	0	95-100	95-100	90-100	60-95	30-50	10-25
	36-56	Stratified sand to loamy sand.	SM, SP-SM	A-2-4, A-1, A-3	0	95-100	75-100	35-70	5-20	---	NP
	56-65	Stratified sand to clay.	CL, CH, SM, SP-SM	A-6, A-7, A-2, A-3	0	100	95-100	65-100	5-95	<70	NP-45
1954B----- Spinks	0-9	Loamy fine sand	SM, SP-SM	A-2-4, A-1-b	0	95-100	80-100	35-80	10-35	<20	NP-4
	9-30	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM	A-2-4, A-1-b	0	95-100	80-100	35-80	10-35	<20	NP-3
	30-54	Stratified sandy loam to sand.	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	50-80	5-35	<25	NP-6
	54	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit Pct	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
1954C----- Spinks	0-7	Loamy fine sand	SM, SP-SM	A-2-4, A-1-b	0	95-100	80-100	35-80	10-35	<20	NP-4
	7-51	Loamy fine sand, loamy sand, fine sand.	SP-SM, SM	A-2-4, A-1-b	0	95-100	80-100	35-80	10-35	<20	NP-3
	51-55	Stratified sandy loam to sand.	SP-SM, SM, SM-SC	A-2-4, A-3	0	95-100	95-100	50-80	5-35	<25	NP-6
	55	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
1955A, 1955B----- Waukee	0-12	Loam-----	CL	A-6	0	100	90-100	70-90	50-75	30-40	10-20
	12-24	Loam, silt loam	CL	A-4, A-6	0	100	90-95	75-85	50-60	25-35	8-15
	24-30	Gravelly sandy loam, sandy loam, loam.	CL, SC, CL-ML, SM-SC	A-6, A-4, A-2	0	80-100	70-100	40-95	25-75	<30	5-12
	30-42	Loamy sand, sand	SM, SP-SM	A-2, A-3, A-1	0	80-100	70-100	35-70	5-30	<20	NP-4
	42-48	Clay loam, clay, loam.	CL, CH	A-6, A-7	0	100	95-100	85-95	60-95	25-70	10-40
	48	Weathered bedrock, unweathered bedrock.	---	---	---	---	---	---	---	---	---
1960B----- Haverhill Variant	0-8	Clay loam-----	CL	A-6, A-7	0	100	100	85-95	60-75	35-45	15-25
	8-18	Clay-----	CL, CH	A-7	0	95-100	85-100	85-100	80-95	40-55	20-35
	18-60	Clay, gravelly clay loam, gravelly clay.	CH, CL	A-7, A-6	0-5	90-100	70-95	65-95	60-90	35-55	18-35
1990----- Otter	0-16	Mucky silt loam	CL	A-6, A-7, A-4	0	100	95-100	90-100	80-100	25-45	7-20
	16-30	Silt loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	10-20
	30-60	Silt loam, sandy loam, silty clay loam.	CL, CL-ML, SM-SC, SC	A-4, A-6, A-7	0	90-100	80-100	55-95	45-85	25-45	5-20

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
11B----- Sogn	0-19 19	18-25 ---	1.15-1.20 ---	0.6-2.0 ---	0.17-0.22 ---	6.1-8.4 ---	Moderate----- -----	0.32 -----	2	6	2-4
11D----- Sogn	0-15 15	18-25 ---	1.15-1.20 ---	0.6-2.0 ---	0.17-0.22 ---	6.1-8.4 ---	Moderate----- -----	0.32 -----	2	6	2-4
19----- Chaseburg	0-9 9-60	12-16 10-18	1.35-1.55 1.55-1.65	0.6-2.0 0.6-2.0	0.22-0.24 0.18-0.22	6.1-7.8 6.1-7.8	Low----- Low-----	0.37 0.37	5	5	2-3
24----- Kasson	0-9 9-17 17-60	18-27 24-32 20-32	1.45-1.55 1.45-1.55 1.60-1.80	0.6-2.0 0.6-2.0 0.2-0.6	0.22-0.24 0.18-0.22 0.15-0.19	5.6-6.5 4.5-6.0 5.1-7.3	Low----- Moderate----- Moderate-----	0.32 0.32 0.32	5	5	2-4
25----- Becker	0-9 9-36 36-43 43-60	5-18 5-18 2-10 1-10	1.45-1.55 1.45-1.55 1.55-1.65 1.60-1.70	2.0-6.0 2.0-6.0 6.0-20 6.0-20	0.16-0.20 0.15-0.20 0.05-0.10 0.02-0.07	5.6-7.3 5.6-7.3 6.1-7.8 6.1-7.8	Low----- Low----- Low----- Low-----	0.20 0.20 0.15 0.15	4	3	2-5
79B----- Billett	0-9 9-26 26-30 30-60	7-15 10-18 8-18 2-7	1.40-1.70 1.40-1.70 1.50-1.70 1.60-1.70	2.0-6.0 2.0-6.0 2.0-6.0 6.0-20	0.13-0.18 0.10-0.15 0.05-0.12 0.02-0.10	5.6-7.8 5.1-7.3 5.6-7.3 5.1-7.8	Low----- Low----- Low----- Low-----	0.20 0.20 0.20 0.10	5	3	1-2
81B----- Boone	0-8 8-25 25-60	2-6 0-3 ---	1.55-1.65 1.55-1.70 ---	6.0-20 6.0-20 ---	0.10-0.13 0.04-0.11 ---	5.1-7.3 5.1-7.3 ---	Low----- Low----- -----	0.17 0.15 -----	4	2	<1
81C----- Boone	0-8 8-24 24-60	2-6 0-3 ---	1.55-1.65 1.55-1.70 ---	6.0-20 6.0-20 ---	0.10-0.13 0.04-0.11 ---	5.1-7.3 5.1-7.3 ---	Low----- Low----- -----	0.17 0.15 -----	4	2	<1
95C----- Dunbarton	0-7 7-10 10-18 18	15-27 24-40 40-80 ---	1.10-1.60 1.05-1.40 1.25-1.55 ---	0.6-2.0 0.6-2.0 0.06-0.2 ---	0.22-0.24 0.18-0.20 0.09-0.13 ---	5.6-7.3 5.6-7.8 6.6-7.8 ---	Low----- Moderate----- High----- -----	0.37 0.37 0.28 -----	2	6	1-3
99B----- Racine	0-5 5-13 13-49 49-60	18-27 22-32 18-32 18-27	1.35-1.45 1.40-1.50 1.55-1.65 1.65-1.80	0.6-2.0 0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.20-0.22 0.15-0.19 0.16-0.19	5.1-7.3 4.5-6.0 4.5-6.0 6.6-7.8	Low----- Moderate----- Low----- Moderate-----	0.32 0.32 0.32 0.32	5	6	2-4
99C----- Racine	0-8 8-22 22-36 36-60	18-27 22-32 18-32 18-27	1.35-1.45 1.40-1.50 1.55-1.65 1.65-1.80	0.6-2.0 0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.20-0.22 0.15-0.19 0.16-0.19	5.1-7.3 4.5-6.0 4.5-6.0 6.6-7.8	Low----- Moderate----- Low----- Moderate-----	0.32 0.32 0.32 0.32	5	6	2-4
103A----- Seaton	0-8 8-45 45-60	10-22 18-27 10-25	1.10-1.45 1.20-1.60 1.20-1.50	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.20-0.22 0.20-0.22	5.6-7.3 5.1-7.3 5.6-8.4	Low----- Low----- Low-----	0.37 0.37 0.37	5	5	1-3
103B----- Seaton	0-8 8-46 46-60	10-22 18-27 10-25	1.10-1.45 1.20-1.60 1.20-1.50	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.20-0.22 0.20-0.22	5.6-7.3 5.1-7.3 5.6-8.4	Low----- Low----- Low-----	0.37 0.37 0.37	5	5	1-3
103C----- Seaton	0-8 8-39 39-60	10-22 18-27 10-25	1.10-1.45 1.20-1.60 1.20-1.50	0.6-2.0 0.6-2.0 0.6-2.0	0.22-0.24 0.20-0.22 0.20-0.22	5.6-7.3 5.1-7.3 5.6-8.4	Low----- Low----- Low-----	0.37 0.37 0.37	5	5	1-3



TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH		K	T	group	Pct
103D----- Seaton	0-7	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	7-53	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
	53-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.37			
173F----- Frontenac	0-15	18-27	1.35-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Moderate-----	0.32	4	6	2-5
	15-27	18-27	1.40-1.50	0.6-2.0	0.17-0.22	5.6-7.3	Moderate-----	0.32			
	27-60	5-10	1.45-1.70	2.0-6.0	0.04-0.10	6.6-7.8	Low-----	0.24			
174D----- Gale	0-10	12-20	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----	0.37	4	5	1-3
	10-31	20-32	1.45-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.37			
	31-34	18-30	1.45-1.55	0.6-2.0	0.17-0.22	4.5-6.5	Moderate-----	0.37			
	34-37	1-14	1.30-1.50	6.0-20	0.05-0.14	4.5-6.5	Low-----	0.15			
	37-60	---	---	---	---	---	-----	---			
176----- Garwin	0-9	22-27	1.30-1.35	0.6-2.0	0.21-0.23	5.6-7.3	Moderate-----	0.28	5	6	6-7
	9-39	27-35	1.28-1.35	0.6-2.0	0.18-0.20	6.1-7.3	High-----	0.28			
	39-60	20-26	1.35-1.45	0.6-2.0	0.20-0.22	6.6-7.8	Moderate-----	0.28			
194----- Huntsville	0-50	18-27	1.15-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Moderate-----	0.28	5	6	3-4
	50-60	15-25	1.20-1.50	0.6-2.0	0.12-0.21	6.1-7.8	Low-----	0.28			
198C----- Rollingstone	0-7	12-25	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.43	3	6	1-3
	7-15	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.43			
	15-60	60-80	1.30-1.40	0.06-0.2	0.09-0.14	4.5-5.5	Moderate-----	0.28			
198D----- Rollingstone	0-5	12-25	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.43	3	6	1-3
	5-10	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.43			
	10-60	60-80	1.30-1.40	0.06-0.2	0.09-0.14	4.5-5.5	Moderate-----	0.28			
215B----- Southridge	0-8	8-17	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	4	5	2-3
	8-30	10-30	1.45-1.55	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	30-60	55-80	1.40-1.45	0.06-0.2	0.09-0.13	4.5-6.0	Moderate-----	0.28			
215C----- Southridge	0-9	8-17	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	4	5	2-3
	9-29	10-30	1.45-1.55	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	29-60	55-80	1.40-1.45	0.06-0.2	0.09-0.13	4.5-6.0	Moderate-----	0.28			
215D----- Southridge	0-8	8-17	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	4	5	2-3
	8-28	10-30	1.45-1.55	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	28-60	55-80	1.40-1.45	0.06-0.2	0.09-0.13	4.5-6.0	Moderate-----	0.28			
262B----- Medary	0-9	15-27	1.35-1.60	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.37	3	5	1-2
	9-13	25-40	1.55-1.65	0.2-0.6	0.18-0.22	4.5-6.0	Moderate-----	0.37			
	13-56	35-60	1.55-1.70	0.06-0.2	0.11-0.20	4.5-6.0	High-----	0.37			
	56-60	40-60	1.60-1.70	0.06-0.2	0.09-0.13	5.1-7.3	High-----	0.28			
	60-70	25-50	1.30-1.60	0.06-0.2	0.12-0.20	5.1-7.8	High-----	0.28			
271----- Minneiska	0-8	5-18	1.35-1.50	2.0-6.0	0.15-0.18	7.4-8.4	Low-----	0.20	5	3	2-5
	8-46	5-18	1.40-1.60	2.0-6.0	0.13-0.18	7.4-8.4	Low-----	0.28			
	46-60	2-5	1.50-1.65	6.0-20	0.05-0.08	7.4-8.4	Low-----	0.10			
283B, 283C----- Plainfield	0-8	2-5	1.50-1.65	6.0-20	0.04-0.09	5.1-7.3	Low-----	0.15	5	1	.5-2
	8-31	0-4	1.50-1.65	6.0-20	0.04-0.07	4.5-6.5	Low-----	0.15			
	31-60	0-4	1.50-1.70	6.0-20	0.03-0.07	4.5-6.5	Low-----	0.15			
283D----- Plainfield	0-4	2-5	1.50-1.65	6.0-20	0.04-0.09	5.1-7.3	Low-----	0.15	5	1	.5-2
	4-31	0-4	1.50-1.65	6.0-20	0.04-0.07	4.5-6.5	Low-----	0.15			
	31-60	0-4	1.50-1.70	6.0-20	0.03-0.07	4.5-6.5	Low-----	0.15			
283F----- Plainfield	0-3	2-5	1.50-1.65	6.0-20	0.04-0.09	5.1-7.3	Low-----	0.15	5	1	.5-2
	3-34	0-4	1.50-1.65	6.0-20	0.04-0.07	4.5-6.5	Low-----	0.15			
	34-60	0-4	1.50-1.70	6.0-20	0.03-0.07	4.5-6.5	Low-----	0.15			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
285A----- Port Byron	0-19	18-27	1.10-1.20	0.6-2.0	0.22-0.24	5.1-8.4	Low-----	0.32	5	6	2-4
	19-42	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.43			
	42-60	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.43			
285B----- Port Byron	0-16	18-27	1.10-1.20	0.6-2.0	0.22-0.24	5.1-8.4	Low-----	0.32	5	6	2-4
	16-42	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.43			
	42-60	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.43			
285C----- Port Byron	0-13	18-27	1.10-1.20	0.6-2.0	0.22-0.24	5.1-8.4	Low-----	0.32	5	6	2-4
	13-50	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.43			
	50-60	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.43			
299B----- Rockton	0-9	18-27	1.30-1.40	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.28	4	6	2-6
	9-22	25-35	1.40-1.55	0.6-2.0	0.17-0.19	5.1-6.5	Moderate----	0.28			
	22-27	35-60	1.35-1.45	0.6-2.0	0.10-0.14	5.6-7.3	High-----	0.28			
	27	---	---	---	---	---	-----	---			
301A----- Lindstrom	0-9	10-20	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.28	5	5	3-5
	9-36	18-24	1.20-1.30	0.6-2.0	0.22-0.26	5.6-7.3	Low-----	0.28			
	36-60	18-24	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.43			
301C----- Lindstrom	0-9	10-20	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.28	5	5	3-5
	9-35	18-24	1.20-1.30	0.6-2.0	0.22-0.26	5.6-7.3	Low-----	0.28			
	35-60	18-24	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.43			
301D----- Lindstrom	0-9	10-20	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.28	5	5	3-5
	9-27	18-24	1.20-1.30	0.6-2.0	0.22-0.26	5.6-7.3	Low-----	0.28			
	27-60	18-24	1.30-1.40	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.43			
322C2----- Timula	0-24	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low-----	0.37	4	5	.5-1
	24-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low-----	0.37			
322D2----- Timula	0-30	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low-----	0.37	4	5	.5-1
	30-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low-----	0.37			
322E2----- Timula	0-32	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low-----	0.37	4	5	.5-1
	32-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low-----	0.37			
322F----- Timula	0-24	10-18	1.30-1.60	0.6-2.0	0.20-0.24	6.1-7.8	Low-----	0.37	4	5	1-2
	24-60	10-18	1.40-1.60	0.6-2.0	0.18-0.20	7.4-8.4	Low-----	0.37			
331----- Tripoli	0-16	28-32	1.40-1.45	0.6-2.0	0.19-0.21	6.1-7.3	Moderate----	0.24	5	7	6-7
	16-26	22-28	1.45-1.70	0.6-2.0	0.17-0.19	6.6-7.8	Low-----	0.32			
	26-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	7.4-8.4	Low-----	0.32			
369B----- Waubeeek	0-9	19-24	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate----	0.32	5	6	2-3
	9-26	25-34	1.25-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate----	0.43			
	26-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.1-7.3	Low-----	0.43			
369C----- Waubeeek	0-8	19-24	1.25-1.30	0.6-2.0	0.21-0.23	5.6-7.3	Moderate----	0.32	5	6	2-3
	8-32	25-34	1.25-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate----	0.43			
	32-60	20-28	1.65-1.75	0.6-2.0	0.17-0.19	5.1-7.3	Low-----	0.43			
388C----- Seaton	0-8	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	8-46	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
	46-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.37			
388D----- Seaton	0-9	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	9-50	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
	50-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.37			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter
								K	T		Pct
388E----- Seaton	0-6	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	6-35	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
	35-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.37			
401B----- Mt. Carroll	0-8	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	5	6	2-3
	8-54	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.43			
	54-60	16-24	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.43			
401C----- Mt. Carroll	0-8	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	5	6	2-3
	8-40	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.43			
	40-60	16-24	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.43			
401D----- Mt. Carroll	0-7	15-22	1.10-1.20	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	5	6	2-3
	7-55	18-27	1.15-1.30	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.43			
	55-60	16-24	1.20-1.40	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.43			
455A----- Festina	0-11	18-24	1.30-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	5	6	2-3
	11-53	24-29	1.35-1.40	0.6-2.0	0.20-0.22	5.1-6.0	Moderate----	0.43			
	53-60	22-26	1.40-1.45	0.6-2.0	0.20-0.22	5.1-6.5	Moderate----	0.43			
455B----- Festina	0-8	18-24	1.30-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	5	6	2-3
	8-48	24-29	1.35-1.40	0.6-2.0	0.20-0.22	5.1-6.0	Moderate----	0.43			
	48-60	22-26	1.40-1.45	0.6-2.0	0.20-0.22	5.1-6.5	Moderate----	0.43			
457E----- Lacrescent	0-8	18-33	1.25-1.40	0.6-2.0	0.15-0.22	6.6-7.3	Low-----	0.20	3	8	3-5
	8-15	8-23	1.30-1.50	0.6-6.0	0.06-0.09	6.6-7.3	Low-----	0.32			
	15-48	8-20	1.30-1.50	2.0-6.0	0.05-0.08	7.4-7.8	Low-----	0.32			
457G----- Lacrescent	0-10	18-27	1.25-1.35	0.6-2.0	0.18-0.24	6.6-7.3	Low-----	0.28	3	6	3-5
	10-32	8-23	1.30-1.50	0.6-6.0	0.06-0.09	6.6-7.3	Low-----	0.32			
	32-60	8-20	1.30-1.50	2.0-6.0	0.05-0.08	7.4-7.8	Low-----	0.32			
468----- Otter	0-28	18-27	1.10-1.25	0.6-2.0	0.22-0.24	6.1-7.8	Low-----	0.28	5	6	5-10
	28-60	18-28	1.20-1.45	0.6-2.0	0.17-0.22	6.1-7.8	Moderate----	0.43			
474B----- Haverhill	0-4	28-40	1.00-1.40	0.2-0.6	0.16-0.25	7.4-7.8	High-----	0.37	4	8	5-15
	4-30	40-50	1.25-1.40	0.06-0.2	0.09-0.16	7.4-7.8	High-----	0.37			
	30-60	---	---	---	---	---	-----	---			
476B----- Frankville	0-7	18-25	1.30-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate----	0.32	4	6	2-3
	7-24	23-32	1.30-1.45	0.6-2.0	0.18-0.20	5.6-6.5	Moderate----	0.43			
	24-38	40-55	1.50-1.60	0.06-0.2	0.12-0.15	6.1-7.3	High-----	0.32			
	38	---	---	---	---	---	-----	---			
476C----- Frankville	0-8	18-25	1.30-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate----	0.32	4	6	2-3
	8-26	23-32	1.30-1.45	0.6-2.0	0.18-0.20	5.6-6.5	Moderate----	0.43			
	26-36	40-55	1.50-1.60	0.06-0.2	0.12-0.15	6.1-7.3	High-----	0.32			
	36	---	---	---	---	---	-----	---			
476D----- Frankville	0-7	18-25	1.30-1.35	0.6-2.0	0.21-0.23	6.6-7.3	Moderate----	0.32	4	6	2-3
	7-25	23-32	1.30-1.45	0.6-2.0	0.18-0.20	5.6-6.5	Moderate----	0.43			
	25-35	40-55	1.50-1.60	0.06-0.2	0.12-0.15	6.1-7.3	High-----	0.32			
	35	---	---	---	---	---	-----	---			
477----- Littleton	0-8	18-27	1.20-1.45	0.6-2.0	0.20-0.24	5.6-7.8	Low-----	0.32	5	6	3-4
	8-35	22-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.8	Low-----	0.32			
	35-60	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.8	Low-----	0.43			
483----- Waukee	0-21	18-24	1.40-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.24	4	6	3-4
	21-36	18-27	1.40-1.50	0.6-2.0	0.15-0.19	5.1-6.0	Low-----	0.24			
	36-60	2-8	1.50-1.75	>20	0.02-0.06	5.6-6.5	Low-----	0.10			

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
484D----- Eyota	0-20	5-18	1.45-1.60	2.0-6.0	0.13-0.16	5.1-7.3	Low-----	0.20	5	3	2-3
	20-26	5-18	1.50-1.60	2.0-6.0	0.12-0.14	4.5-6.5	Low-----	0.20			
	26-48	15-25	1.35-1.45	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	48-60	1-18	1.40-1.60	2.0-20	0.08-0.14	6.1-7.3	Low-----	0.43			
488G----- Brodale	0-7	5-18	1.15-1.30	0.6-2.0	0.06-0.12	6.6-8.4	Low-----	0.17	5	8	2-5
	7-60	5-18	1.20-1.35	0.6-6.0	0.04-0.09	7.4-8.4	Low-----	0.20			
492B----- Nasset	0-11	18-24	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate----	0.32	4	6	2-3
	11-37	26-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate----	0.43			
	37-60	40-55	1.50-1.60	0.06-0.2	0.12-0.15	6.6-7.3	High-----	0.32			
492C----- Nasset	0-9	18-24	1.25-1.30	0.6-2.0	0.21-0.23	5.1-7.3	Moderate----	0.32	4	6	2-3
	9-45	26-34	1.30-1.35	0.6-2.0	0.18-0.20	5.1-6.5	Moderate----	0.43			
	45-60	40-55	1.50-1.60	0.06-0.2	0.12-0.15	6.6-7.3	High-----	0.32			
493B----- Oronoco	0-8	5-15	1.40-1.50	2.0-6.0	0.15-0.18	6.1-7.3	Low-----	0.24	5	3	1-4
	8-53	5-18	1.40-1.50	0.6-2.0	0.15-0.19	5.6-7.8	Low-----	0.32			
	53-60	5-18	1.40-1.50	0.6-2.0	0.20-0.22	7.4-7.8	Low-----	0.43			
501B----- NewGlarus	0-13	12-27	1.20-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low-----	0.37	4	5	1-3
	13-28	20-35	1.25-1.45	0.2-2.0	0.18-0.22	5.6-7.3	Moderate----	0.37			
	28-39	40-80	1.25-1.55	0.06-0.2	0.09-0.13	5.6-7.3	High-----	0.37			
	39	---	---	---	---	---	-----	---			
501C----- NewGlarus	0-8	12-27	1.20-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low-----	0.37	4	5	1-3
	8-23	20-35	1.25-1.45	0.2-2.0	0.18-0.22	5.6-7.3	Moderate----	0.37			
	23-37	40-80	1.25-1.55	0.06-0.2	0.09-0.13	5.6-7.3	High-----	0.37			
	37	---	---	---	---	---	-----	---			
501D----- NewGlarus	0-12	12-27	1.20-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low-----	0.37	4	5	1-3
	12-26	20-35	1.25-1.45	0.2-2.0	0.18-0.22	5.6-7.3	Moderate----	0.37			
	26-36	40-80	1.25-1.55	0.06-0.2	0.09-0.13	5.6-7.3	High-----	0.37			
	36	---	---	---	---	---	-----	---			
501E----- NewGlarus	0-3	12-27	1.20-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Low-----	0.37	4	5	1-3
	3-24	20-35	1.25-1.45	0.2-2.0	0.18-0.22	5.6-7.3	Moderate----	0.37			
	24-34	40-80	1.25-1.55	0.06-0.2	0.09-0.13	5.6-7.3	High-----	0.37			
	34	---	---	---	---	---	-----	---			
522----- Boots	0-8	---	0.16-0.45	0.6-6.0	0.35-0.45	5.6-7.3	-----	---	5	2	60-90
	8-60	---	0.16-0.28	0.6-6.0	0.35-0.45	5.6-7.3	-----	---			
576----- Newalbin	0-7	10-18	1.35-1.50	0.6-2.0	0.20-0.24	6.1-7.3	Low-----	0.32	5	5	1-3
	7-28	10-18	1.35-1.50	0.6-2.0	0.17-0.22	6.1-7.3	Low-----	0.32			
	28-60	10-35	1.35-1.50	0.6-2.0	0.17-0.22	6.1-7.8	Low-----	0.32			
577----- Newalbin	0-7	10-18	1.35-1.50	0.6-2.0	0.20-0.24	6.1-7.3	Low-----	0.32	5	5	1-3
	7-34	10-18	1.35-1.50	0.6-2.0	0.17-0.22	6.1-7.3	Low-----	0.32			
	34-60	10-35	1.35-1.50	0.6-2.0	0.17-0.22	6.1-7.8	Low-----	0.32			
578----- Newalbin	0-10	10-18	1.35-1.50	0.6-2.0	0.20-0.24	6.1-7.3	Low-----	0.32	5	5	1-3
	10-30	10-18	1.35-1.50	0.6-2.0	0.17-0.22	6.1-7.3	Low-----	0.32			
	30-60	10-35	1.35-1.50	0.6-2.0	0.17-0.22	6.1-7.8	Low-----	0.32			
580B*: Blackhammer-----	0-8	8-23	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	8-22	18-27	1.45-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.37			
	22-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate----	0.28			

See footnote at end of table.



TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
580B*:											
Southridge-----	0-8	8-17	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	4	5	2-3
	8-28	10-30	1.45-1.55	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	28-60	55-80	1.40-1.45	0.06-0.2	0.09-0.13	4.5-6.0	Moderate-----	0.28			
580C*:											
Blackhammer-----	0-9	8-23	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	9-26	18-27	1.45-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.37			
	26-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate-----	0.28			
Southridge-----	0-9	8-17	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	4	5	2-3
	9-29	10-30	1.45-1.55	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	29-60	55-80	1.40-1.45	0.06-0.2	0.09-0.13	4.5-6.0	Moderate-----	0.28			
580D*:											
Blackhammer-----	0-8	8-23	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	8-25	18-27	1.45-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.37			
	25-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate-----	0.28			
Southridge-----	0-8	8-17	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	4	5	2-3
	8-25	10-30	1.45-1.55	0.6-2.0	0.20-0.22	4.5-6.5	Low-----	0.43			
	25-60	55-80	1.40-1.45	0.06-0.2	0.09-0.13	4.5-6.0	Moderate-----	0.28			
584F*:											
Lamoille-----	0-12	12-27	1.25-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Low-----	0.43	3	6	1-3
	12-28	35-55	1.40-1.60	0.06-0.6	0.12-0.16	5.1-6.0	Moderate-----	0.43			
	28-42	25-45	1.30-1.50	0.2-0.6	0.07-0.16	5.6-7.3	Moderate-----	0.32			
	42-60	8-27	1.30-1.50	2.0-6.0	0.06-0.12	7.4-8.4	Low-----	0.32			
Dorerton-----	0-8	10-18	1.30-1.40	0.6-2.0	0.20-0.24	5.1-7.3	Low-----	0.32	3	5	1-2
	8-12	18-35	1.30-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Low-----	0.32			
	12-24	20-35	1.20-1.45	0.6-2.0	0.08-0.14	5.6-7.3	Low-----	0.24			
	24-60	2-25	1.20-1.45	2.0-6.0	0.03-0.09	7.4-8.4	Low-----	0.10			
586C*:											
Nodine-----	0-7	12-23	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	6	1-3
	7-15	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.37			
	15-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate-----	0.28			
Rollingstone----	0-7	12-25	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.43	3	6	1-3
	7-15	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.43			
	15-60	60-80	1.30-1.40	0.06-0.2	0.09-0.14	4.5-5.5	Moderate-----	0.28			
586D*:											
Nodine-----	0-6	12-23	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	6	1-3
	6-16	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.37			
	16-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate-----	0.28			
Rollingstone----	0-5	12-25	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.43	3	6	1-3
	5-10	15-27	1.35-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low-----	0.43			
	10-60	60-80	1.30-1.40	0.06-0.2	0.09-0.14	4.5-5.5	Moderate-----	0.28			
587B-----	0-7	21-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	4	6	1-2
Palsgrove	7-37	25-35	1.40-1.60	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	37-52	35-75	1.20-1.40	0.06-0.2	0.08-0.10	5.6-7.3	High-----	0.32			
	52	---	---	---	---	---	-----	---			
587C-----	0-9	21-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	4	6	1-2
Palsgrove	9-41	25-35	1.40-1.60	0.6-2.0	0.18-0.20	5.1-7.3	Moderate-----	0.43			
	41-52	35-75	1.20-1.40	0.06-0.2	0.08-0.10	5.6-7.3	High-----	0.32			
	52	---	---	---	---	---	-----	---			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
587D----- Palsgrove	0-9	21-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	4	6	1-2
	9-40	25-35	1.40-1.60	0.6-2.0	0.18-0.20	5.1-7.3	Moderate----	0.43			
	40-48	35-75	1.20-1.40	0.06-0.2	0.08-0.10	5.6-7.3	High-----	0.32			
	48	---	---	---	---	---	-----	---			
592E*: Lamoille-----	0-15	12-27	1.25-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Low-----	0.43	3	6	1-3
	15-28	35-55	1.40-1.60	0.06-0.6	0.12-0.16	5.1-6.0	Moderate----	0.43			
	28-44	25-45	1.30-1.50	0.2-0.6	0.07-0.16	5.6-7.3	Moderate----	0.32			
	44-60	8-27	1.30-1.50	2.0-6.0	0.06-0.12	7.4-8.4	Low-----	0.32			
Elbaville-----	0-9	10-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low-----	0.32	4	5	1-2
	9-22	24-35	1.35-1.50	0.2-0.6	0.16-0.19	5.1-7.3	Moderate----	0.32			
	22-36	35-50	1.25-1.35	0.2-0.6	0.13-0.16	5.6-7.3	Moderate----	0.32			
	36-60	5-18	1.40-1.65	2.0-6.0	0.06-0.10	7.4-7.8	Low-----	0.10			
598B----- Beavercreek	0-8	10-18	1.30-1.45	2.0-6.0	0.20-0.22	6.1-7.3	Low-----	0.24	3	5	2-3
	8-60	5-18	1.40-1.50	2.0-6.0	0.04-0.08	6.6-7.8	Low-----	0.17			
599E----- Norden	0-6	7-18	1.35-1.50	0.6-2.0	0.20-0.24	5.1-7.3	Low-----	0.32	4	5	1-2
	6-15	15-30	1.45-1.55	0.6-2.0	0.17-0.22	5.1-7.3	Moderate----	0.37			
	15-42	18-30	1.45-1.55	0.6-2.0	0.15-0.20	5.1-7.3	Moderate----	0.37			
	42-60	6-25	1.45-1.55	0.6-2.0	0.09-0.19	4.5-7.3	Low-----	0.24			
599F----- Norden	0-6	7-18	1.35-1.50	0.6-2.0	0.20-0.24	5.1-7.3	Low-----	0.32	4	5	1-2
	6-15	15-30	1.45-1.55	0.6-2.0	0.17-0.22	5.1-7.3	Moderate----	0.37			
	15-29	18-30	1.45-1.55	0.6-2.0	0.15-0.20	5.1-7.3	Moderate----	0.37			
	29-60	---	---	---	---	---	-----	---			
604*: Huntsville-----	0-46	18-27	1.15-1.35	0.6-2.0	0.22-0.24	6.1-7.3	Moderate----	0.28	5	6	3-4
	46-60	15-25	1.20-1.50	0.6-2.0	0.12-0.21	6.1-7.8	Low-----	0.28			
	0-10	5-18	1.40-1.50	2.0-6.0	0.15-0.20	6.1-7.3	Low-----	0.17	3	8	1-2
	10-60	5-18	1.40-1.50	2.0-6.0	0.04-0.08	6.6-7.8	Low-----	0.17			
606----- Shiloh	0-12	20-27	1.25-1.40	0.6-2.0	0.22-0.24	6.1-7.3	Moderate----	0.28	5	6	4-6
	12-60	35-45	1.35-1.55	0.2-0.6	0.09-0.18	6.1-7.8	High-----	0.28			
815F*: Elbaville-----	0-15	10-27	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low-----	0.32	4	5	1-2
	15-26	24-35	1.35-1.50	0.2-0.6	0.16-0.19	5.1-7.3	Moderate----	0.32			
	26-35	35-50	1.25-1.35	0.2-0.6	0.13-0.16	5.6-7.3	Moderate----	0.32			
	35-52	20-35	1.35-1.50	0.6-2.0	0.12-0.14	6.6-7.8	Moderate----	0.24			
	52-60	5-18	1.40-1.65	2.0-6.0	0.06-0.10	7.4-7.8	Low-----	0.10			
Seaton-----	0-8	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	8-48	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
	48-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.37			
826B*: Gale-----	0-9	12-20	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----	0.37	4	5	1-3
	9-30	20-32	1.45-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate----	0.37			
	30-36	1-14	1.30-1.50	6.0-20	0.05-0.14	4.5-6.5	Low-----	0.15			
	36-60	---	---	---	---	---	-----	---			
Blackhammer-----	0-7	8-23	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	7-27	18-27	1.45-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.37			
	27-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate----	0.28			

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
826C*:											
Gale-----	0-8	12-20	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----	0.37	4	5	1-3
	8-32	20-32	1.45-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate----	0.37			
	32-38	1-14	1.30-1.50	6.0-20	0.05-0.14	4.5-6.5	Low-----	0.15			
	38-60	---	---	---	---	---	-----	---			
Blackhammer-----	0-9	8-23	1.40-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	9-26	18-27	1.45-1.55	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.37			
	26-60	18-35	1.35-1.65	0.6-2.0	0.08-0.16	5.1-6.0	Moderate----	0.28			
829C*:											
Seaton-----	0-8	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	8-43	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
	43-60	10-25	1.20-1.50	0.6-2.0	0.20-0.22	5.6-8.4	Low-----	0.37			
Gale-----	0-8	12-20	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low-----	0.37	4	5	1-3
	8-32	20-32	1.45-1.55	0.6-2.0	0.18-0.22	4.5-6.5	Moderate----	0.37			
	32-36	18-30	1.45-1.55	0.6-2.0	0.17-0.22	4.5-6.5	Moderate----	0.37			
	36-60	---	---	---	---	---	-----	---			
830D*:											
Eleva-----	0-5	5-20	1.40-1.60	0.6-2.0	0.12-0.20	5.1-7.3	Low-----	0.28	4	8	1-2
	5-9	5-20	1.40-1.60	0.6-2.0	0.12-0.20	5.1-6.0	Low-----	0.17			
	9-22	10-18	1.45-1.65	2.0-6.0	0.12-0.14	5.1-6.0	Low-----	0.20			
	22-26	1-8	1.50-1.70	6.0-20	0.04-0.09	5.1-6.5	Low-----	0.10			
	26-60	---	---	---	---	---	-----	---			
Seaton-----	0-8	10-22	1.10-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.37	5	5	1-3
	8-60	18-27	1.20-1.60	0.6-2.0	0.20-0.22	5.1-7.3	Low-----	0.37			
831F*:											
Spinks-----	0-3	2-15	1.30-1.50	6.0-20	0.10-0.13	5.6-7.3	Low-----	0.17	5	2	1-2
	3-28	2-7	1.40-1.60	6.0-20	0.06-0.11	5.1-6.0	Low-----	0.17			
	28-43	1-15	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low-----	0.17			
	43	---	---	---	---	---	-----	---			
Boone-----	0-7	6-12	1.55-1.65	2.0-6.0	0.16-0.18	5.1-7.3	Low-----	0.24	4	3	<1
	7-13	0-3	1.55-1.70	6.0-20	0.04-0.11	5.1-7.3	Low-----	0.15			
	13-60	---	---	---	---	---	-----	---			
Sogn-----	0-20	18-27	1.15-1.20	0.6-2.0	0.15-0.20	6.1-8.4	Low-----	0.24	2	8	2-4
	20	---	---	---	---	---	-----	---			
832F*:											
Lacrescent-----	0-13	18-33	1.25-1.40	0.6-2.0	0.15-0.22	6.6-7.3	Low-----	0.20	3	8	3-5
	13-28	8-23	1.30-1.50	0.6-6.0	0.06-0.09	6.6-7.3	Low-----	0.32			
	28-60	8-20	1.30-1.50	2.0-6.0	0.05-0.08	7.4-7.8	Low-----	0.32			
Rock outcrop.											
832G*:											
Lacrescent-----	0-14	18-33	1.25-1.40	0.6-2.0	0.15-0.22	6.6-7.3	Low-----	0.20	3	8	3-5
	14-60	8-20	1.30-1.50	2.0-6.0	0.05-0.08	7.4-7.8	Low-----	0.32			
Rock outcrop.											
839*:											
Urban land.											

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter Pct
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					
839*: Minneopa-----	0-16	5-15	1.30-1.50	2.0-6.0	0.13-0.15	5.6-7.3	Low-----	0.20	4	3	4-6
	16-24	5-15	1.40-1.60	2.0-6.0	0.07-0.11	6.1-7.3	Low-----	0.20			
	24-60	1-10	1.50-1.70	6.0-20	0.04-0.09	6.1-8.4	Low-----	0.20			
840*: Urban land.											
Finchford-----	0-8	5-10	1.50-1.55	6.0-20	0.10-0.12	6.1-7.3	Low-----	0.17	5	2	1-3
	8-33	2-8	1.50-1.60	>20	0.04-0.06	5.1-6.5	Low-----	0.17			
	33-60	2-5	1.60-1.70	>20	0.02-0.04	5.1-7.3	Low-----	0.17			
898F*: Bellechester----	0-22	4-8	1.45-1.55	6.0-20	0.10-0.14	6.1-8.4	Low-----	0.15	5	2	2-3
	22-54	2-8	1.50-1.65	6.0-20	0.04-0.08	6.6-8.4	Low-----	0.15			
	54-60	---	---	---	---	---	-----	---			
Brodale-----	0-10	5-18	1.15-1.30	0.6-2.0	0.06-0.12	6.6-8.4	Low-----	0.17	5	8	2-5
	10-34	5-18	1.20-1.35	0.6-6.0	0.04-0.09	7.4-8.4	Low-----	0.20			
	34-38	---	---	---	---	---	-----	---			
1002. Fluvaquents											
1010*. Riverwash											
1013*. Pits, quarries											
1015. Psamments											
1016. Udorthents											
1029*. Pits, gravel											
1822B-----	0-50	3-10	1.45-1.65	2.0-20	0.07-0.10	6.6-7.8	Low-----	0.15	5	1	.5-1
Abscota Variant	50-60	3-10	1.45-1.65	2.0-20	0.07-0.10	6.6-7.8	Low-----	0.17			
1830, 1857-----	0-28	18-25	1.35-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.28	5	6	2-4
Eitzen	28-47	18-27	1.30-1.45	0.6-2.0	0.20-0.22	5.1-6.5	Low-----	0.28			
	47-60	18-27	1.40-1.65	0.6-2.0	0.18-0.20	5.1-6.0	Low-----	0.28			
1860-----	0-12	18-27	1.20-1.40	0.6-2.0	0.20-0.24	6.6-7.8	Low-----	0.28	5	6	6-10
Comfrey	12-60	18-35	1.20-1.40	0.6-2.0	0.16-0.20	6.6-7.8	Moderate----	0.28			
1861-----	0-7	12-16	1.35-1.55	0.6-2.0	0.22-0.24	6.1-7.8	Low-----	0.37	5	5	2-3
Chaseburg	7-60	10-18	1.55-1.65	0.6-2.0	0.18-0.22	6.1-7.8	Low-----	0.37			
1893B-----	0-19	12-18	1.45-1.55	0.6-2.0	0.18-0.22	6.1-7.3	Low-----	0.28	4	5	3-5
Beavercreek	19-32	12-18	1.40-1.50	0.6-2.0	0.15-0.17	6.1-7.3	Low-----	0.28			
Variant	32-60	8-16	1.40-1.50	2.0-6.0	0.06-0.12	6.6-7.8	Low-----	0.20			
1936-----	0-13	10-20	1.50-1.55	2.0-6.0	0.13-0.15	6.1-7.3	Low-----	0.20	4	3	4-5
Hoopeston	13-30	12-18	1.55-1.60	2.0-6.0	0.12-0.14	5.1-6.5	Low-----	0.20			
	30-40	4-7	1.60-1.70	6.0-20	0.08-0.10	5.1-6.5	Low-----	0.20			
	40-45	4-50	1.65-1.75	0.2-2.0	0.03-0.08	5.1-7.3	Moderate----	0.20			
	45-60	---	---	---	---	---	-----	---			

See footnote at end of table.



TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction pH	Shrink-swell potential	Erosion factors		Wind erodi- bility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
1937----- Lawler	0-12	18-25	1.35-1.55	0.6-2.0	0.20-0.22	5.6-7.3	Moderate-----	0.28	4	6	4-5
	12-35	18-24	1.35-1.55	0.6-2.0	0.16-0.19	5.6-6.5	Moderate-----	0.28			
	35-52	3-7	1.50-1.60	>20	0.05-0.10	5.6-6.5	Low-----	0.10			
	52	---	---	---	---	---	-----	---			
1951A----- Flagler	0-14	10-20	1.50-1.55	2.0-6.0	0.13-0.20	6.1-7.3	Low-----	0.20	4	3	3-4
	14-28	10-18	1.55-1.60	2.0-6.0	0.12-0.14	5.1-6.5	Low-----	0.20			
	28-40	2-7	1.60-1.70	>20	0.08-0.11	5.6-7.3	Low-----	0.17			
	40-49	4-18	1.60-1.70	2.0-6.0	0.06-0.15	5.6-7.3	Low-----	0.17			
	49-51	18-60	1.65-1.80	0.2-2.0	0.06-0.10	5.6-7.3	Moderate-----	0.32			
	51-60	---	---	---	---	---	-----	---			
1951B----- Flagler	0-8	10-20	1.50-1.55	2.0-6.0	0.13-0.20	6.1-7.3	Low-----	0.20	4	3	3-4
	8-11	10-18	1.55-1.60	2.0-6.0	0.12-0.14	5.1-6.5	Low-----	0.20			
	11-34	2-7	1.60-1.70	>20	0.08-0.11	5.6-7.3	Low-----	0.17			
	34-52	18-60	1.65-1.80	0.2-2.0	0.06-0.10	5.6-7.3	Moderate-----	0.32			
	52	---	---	---	---	---	-----	---			
1952B----- Keltner	0-13	20-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	4	6	3-4
	13-28	27-35	1.25-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43			
	28-51	38-50	1.40-1.60	0.06-0.2	0.04-0.06	6.6-8.4	Moderate-----	0.32			
	51-60	---	---	---	---	---	-----	---			
1952C----- Keltner	0-16	20-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.3	Low-----	0.32	4	6	3-4
	16-27	27-35	1.25-1.45	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.43			
	27-47	38-50	1.40-1.60	0.06-0.2	0.04-0.06	6.6-8.4	Moderate-----	0.32			
	47-60	---	---	---	---	---	-----	---			
1953----- Marshan	0-17	18-27	1.35-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----	0.28	4	6	3-6
	17-36	18-35	1.40-1.55	0.6-2.0	0.17-0.22	5.6-6.5	Moderate-----	0.28			
	36-56	4-8	1.40-1.60	6.0-20	0.04-0.10	5.6-6.5	Low-----	0.15			
	56-65	40-55	1.40-1.70	0.06-2.0	0.04-0.10	5.6-7.3	Moderate-----	0.32			
1954B----- Spinks	0-9	2-15	1.30-1.50	6.0-20	0.10-0.13	5.6-7.3	Low-----	0.17	5	2	1-2
	9-30	2-7	1.40-1.60	6.0-20	0.06-0.11	5.1-6.0	Low-----	0.17			
	30-54	1-15	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low-----	0.17			
	54	---	---	---	---	---	-----	---			
1954C----- Spinks	0-7	2-15	1.30-1.50	6.0-20	0.10-0.13	5.6-7.3	Low-----	0.17	5	2	1-2
	7-51	2-7	1.40-1.60	6.0-20	0.06-0.11	5.1-6.0	Low-----	0.17			
	51-55	1-15	1.30-1.60	2.0-6.0	0.05-0.10	5.1-6.0	Low-----	0.17			
	55	---	---	---	---	---	-----	---			
1955A, 1955B----- Waukee	0-12	18-24	1.40-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----	0.24	4	6	3-4
	12-24	18-24	1.40-1.50	0.6-2.0	0.15-0.19	5.1-6.0	Low-----	0.24			
	24-30	10-20	1.45-1.55	2.0-6.0	0.12-0.18	5.1-6.5	Low-----	0.24			
	30-42	4-8	1.50-1.75	>20	0.02-0.06	5.6-6.5	Low-----	0.10			
	42-48	18-60	1.65-1.80	0.2-2.0	0.07-0.12	5.6-7.3	Moderate-----	0.32			
	48	---	---	---	---	---	-----	---			
1960B----- Haverhill Variant	0-8	27-35	1.20-1.30	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.32	3	6	2-4
	8-18	40-60	1.35-1.55	0.06-0.2	0.08-0.12	5.6-7.3	Moderate-----	0.32			
	18-60	35-60	1.40-1.60	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			
1990----- Otter	0-16	18-27	1.10-1.25	0.6-2.0	0.22-0.24	6.1-7.8	Low-----	0.28	5	6	5-10
	16-30	18-28	1.20-1.45	0.6-2.0	0.17-0.22	6.1-7.8	Moderate-----	0.43			
	30-60	15-28	1.30-1.55	0.6-2.0	0.15-0.20	6.1-8.4	Low-----	0.43			

\* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete		
11B, 11D----- Sogn	D	None-----	---	---	>6.0	---	---	4-20	Hard	---	Moderate	Low-----	Low.	
19----- Chaseburg	B	Occasional	Very brief	Nov-Jun	3.0-6.0	Apparent	Nov-Apr	>60	---	---	High-----	Moderate	Moderate.	
24----- Kasson	C	None-----	---	---	2.0-3.0	Perched	Nov-May	>60	---	---	High-----	High-----	Moderate.	
25----- Becker	B	Rare-----	---	---	4.0-6.0	Apparent	Nov-May	>60	---	---	Moderate	Low-----	Low.	
79B----- Billett	B	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	Moderate.	
81B, 81C----- Boone	A	None-----	---	---	>6.0	---	---	20-40	Soft	---	Low-----	Low-----	Moderate.	
95C----- Dunbarton	D	None-----	---	---	>6.0	---	---	12-20	Hard	---	Moderate	Moderate	Low.	
99B, 99C----- Racine	B	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	Moderate.	
103A, 103B, 103C, 103D----- Seaton	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----	Moderate.	
173F----- Frontenac	B	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	Low.	
174D----- Gale	B	None-----	---	---	>6.0	---	---	30-40	Soft	---	High-----	Moderate	Moderate.	
176----- Garwin	B/D	None-----	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	---	High-----	High-----	Moderate.	
194----- Huntsville	B	Rare-----	---	---	4.0-6.0	Apparent	Mar-Jun	>60	---	---	High-----	Low-----	Low.	

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Risk of corrosion		
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Total subsidence	Potential frost action	Uncoated steel
198C, 198D----- Rollingstone	C	None-----	---	---	>6.0	---	---	In --- >60	---	---	Moderate	Moderate
215B, 215C, 215D----- Southridge	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Moderate
262B----- Medary	C	None-----	---	---	2.5-6.0	Perched	Nov-May	>60	---	---	Moderate	High-----
271----- Minneiska	B	Frequent-----	Very brief or brief.	Mar-Jul	3.0-6.0	Apparent	Mar-Jun	>60	---	---	Moderate	Low-----
283B, 283C, 283D, 283F----- Plainfield	A	None-----	---	---	>6.0	---	---	>60	---	---	Low-----	Low-----
285A, 285B, 285C----- Port Byron	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----
299B----- Rockton	B	None-----	---	---	>6.0	---	---	20-40 Hard	---	---	Moderate	Low-----
301A, 301C, 301D----- Lindstrom	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Moderate
322C2, 322D2, 322E2, 322F----- Timula	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----
331----- Tripoli	B/D	None-----	---	---	1.0-2.0	Apparent	Nov-Jul	>60	---	---	High-----	High-----
369B, 369C----- Waubek	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Moderate
388C, 388D, 388E----- Seaton	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----
401B, 401C, 401D----- Mt. Carroll	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Total subsi- dence	Potential frost action		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard- ness				Uncoated steel	Concrete
					<u>Ft</u>			<u>In</u>		<u>In</u>				
455A, 455B----- Festina	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Moderate	Moderate.	
457E, 457G----- Lacrescent	B	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	Low.	
468----- Otter	B/D	Rare-----	---	---	0-2.0	Apparent	Mar-Jun	>60	---	---	High-----	High-----	Low.	
474B----- Haverhill	D	None-----	---	---	0-1.0	Perched	Jan-Dec	20-40	Soft	---	High-----	High-----	Low.	
476B, 476C, 476D----- Frankville	B	None-----	---	---	>6.0	---	---	20-40	Hard	---	High-----	Moderate	Moderate.	
477----- Littleton	B	None-----	---	---	1.0-3.0	Apparent	Apr-Jun	>60	---	---	High-----	High-----	Low.	
483----- Waukee	B	None-----	---	---	>6.0	---	---	>60	---	---	Low-----	Low-----	Moderate.	
484D----- Eyota	A	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	High.	
488G----- Brodale	C	None-----	---	---	>6.0	---	---	40-80	Hard	---	Low-----	Low-----	Low.	
492B, 492C----- Nasset	B	None-----	---	---	>6.0	---	---	>60	Hard	---	High-----	Moderate	Moderate.	
493B----- Oronoco	B	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	Low.	
501B, 501C, 501D, 501E----- NewGlarus	B	None-----	---	---	>6.0	---	---	20-40	Hard	---	High-----	Moderate	Moderate.	
522----- Boots	A/D	None-----	---	---	+1-1.0	Apparent	Nov-Aug	>60	---	40-55	High-----	Moderate	Low.	
576, 577----- Newalbin	B/D	Occasional	Very brief or brief.	Mar-Jul	1.0-3.0	Apparent	Mar-Jul	>60	---	---	High-----	High-----	Low.	
578----- Newalbin	D	Occasional	Brief-----	Mar-Jul	+1-2.0	Apparent	Jan-Dec	>60	---	---	High-----	High-----	Low.	



TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		High	Low	Uncoated steel	Concrete
580B*, 580C*, 580D*: Blackhammer	B	None	---	---	>6.0	---	---	>60	---	---	High	---	Moderate	High.
Southridge	B	None	---	---	>6.0	---	---	>60	---	---	High	---	Moderate	High.
584F*: Lamaille	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	---	Low	Moderate.
Dorerton	B	None	---	---	>6.0	---	---	>60	---	---	Low	---	Low	Moderate.
586C*, 586D*: Nodine	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	---	Moderate	High.
Rollingstone	C	None	---	---	>6.0	---	---	>60	---	---	Moderate	---	Moderate	High.
587B, 587C, 587D: Palsgrove	B	None	---	---	>6.0	---	---	40-60	Hard	---	High	---	High	Moderate.
592E*: Lamaille	B	None	---	---	>6.0	---	---	>60	---	---	Moderate	---	Low	Moderate.
Elbaville	B	None	---	---	>6.0	---	---	>60	---	---	Low	---	Low	Moderate.
598B: Beavercreek	B	Frequent	Very brief	Apr-Jun	>6.0	---	---	>60	---	---	Low	---	Low	Low.
599E, 599F: Norden	B	None	---	---	>6.0	---	---	40-60	Soft	---	Moderate	---	Low	Moderate.
604*: Huntsville	B	Occasional	Very brief or brief.	Jan-Jun	4.0-6.0	Apparent	Mar-Jun	>60	---	---	High	---	Low	Low.
Beavercreek	B	Occasional	Very brief	Apr-Jun	>6.0	---	---	>60	---	---	Low	---	Low	Low.
606: Shiloh	B/D	Frequent	Brief to long.	Mar-Jul	+1-2.0	Apparent	Mar-Jul	>60	---	---	High	---	High	Low.
815F*: Elbaville	B	None	---	---	>6.0	---	---	>60	---	---	Low	---	Low	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Total subsi- dence	Potential frost action	Risk of corrosion		
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard- ness			Uncoated steel	Concrete	
815F*: Seaton-----	B	None-----	---	---	<u>Ft</u>  >6.0	---	---	<u>In</u>  >60	---	<u>In</u>  ---	---	High-----	Low-----	Moderate.
826B*, 826C*: Gale-----	B	None-----	---	---	>6.0	---	---	30-40   Soft	---	---	High-----	Moderate	Moderate.	
Blackhammer----	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Moderate	High.	
829C*: Seaton-----	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----	Moderate.	
Gale-----	B	None-----	---	---	>6.0	---	---	30-40   Soft	---	---	High-----	Moderate	Moderate.	
830D*: Eleva-----	B	None-----	---	---	>6.0	---	---	20-40   Soft	---	---	Moderate	Low-----	Moderate.	
Seaton-----	B	None-----	---	---	>6.0	---	---	>60	---	---	High-----	Low-----	Moderate.	
831F*: Spinks-----	A	None-----	---	---	>6.0	---	---	40-60   Soft	---	---	Low-----	Low-----	Low.	
Boone-----	A	None-----	---	---	>6.0	---	---	20-40   Soft	---	---	Low-----	Low-----	Moderate.	
Sogn-----	D	None-----	---	---	>6.0	---	---	4-20   Hard	---	---	Moderate	Low-----	Low.	
832F*, 832G*: Lacrescent----	B	None-----	---	---	>6.0	---	---	>60	---	---	Moderate	Low-----	Low.	
Rock outcrop.														
839*: Urban land.														
Minneopa-----	B	Rare-----	---	---	3.0-5.0	Apparent	Apr-May	>60	---	---	Moderate	Low-----	Low.	
840*: Urban land.														
Finchford-----	A	None-----	---	---	>6.0	---	---	>60	---	---	Low-----	Low-----	Low.	
898F*: Bellechester----	A	None-----	---	---	>6.0	---	---	40-70   Soft	---	---	Low-----	Low-----	Moderate.	
Brodale-----	C	None-----	---	---	>6.0	---	---	40-80   Hard	---	---	Low-----	Low-----	Low.	

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Total subsidence	Potential frost action		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete		
1002. Fluvaquents								In		In				
1010*. Riverwash														
1013*. Pits, quarries														
1015. Psammments														
1016. Udorthents														
1029*. Pits, gravel														
1822B----- Abscota Variant	A	Occasional	Very brief	Mar-Jun	3.0-6.0	Apparent	Mar-Jun	>60	---	---	Moderate	Moderate	Low.	
1830, 1857----- Eitzen	B	Occasional	Very brief	Apr-Nov	>6.0	---	---	>60	---	---	High-----	Low-----	Moderate.	
1860----- Comfrey	B/D	Frequent-----	Brief to long.	Feb-Jul	0-3.0	Apparent	Apr-Jul	>60	---	---	High-----	High-----	Low.	
1861----- Chaseburg	B	Occasional	Very brief	Nov-Jun	3.0-6.0	Apparent	Nov-Apr	>60	---	---	High-----	Moderate	Moderate.	
1893B----- Beavercreek Variant	B	Occasional	Very brief	Mar-Jun	>6.0	---	---	>60	---	---	Low-----	Low-----	Moderate.	
1936----- Hoopeston	B	None-----	---	---	1.0-3.0	Apparent	Mar-Jun	40-60	Soft	---	High-----	Moderate	Moderate.	
1937----- Lawler	B	None-----	---	---	2.0-4.0	Apparent	Nov-May	40-60	Soft	---	High-----	High-----	Moderate.	
1951A, 1951B----- Flagler	B	None-----	---	---	>6.0	---	---	40-60	Hard	---	Moderate	Moderate	Low.	
1952B, 1952C----- Keltner	B	None-----	---	---	3.0-5.0	Perched	Feb-Jun	40-60	Soft	---	High-----	High-----	Moderate.	

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Total subsi- dence	Potential frost action		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hard- ness				Uncoated steel	Concrete
1953----- Marshan	B/D	None-----	---	---	1.0-2.5	Apparent	Oct-Jun	>60	---	---	High-----	High-----	High-----	Moderate.
1954B, 1954C----- Spinks	A	None-----	---	---	>6.0	---	---	40-60	Soft	---	Low-----	Low-----	Low-----	Low.
1955A, 1955B----- Waukee	B	None-----	---	---	>6.0	---	---	40-60	Soft	---	Low-----	Low-----	Low-----	Moderate.
1960B----- Haverhill Variant	C/D	None-----	---	---	1.0-2.0	Perched	Nov-Jul	>60	---	---	High-----	High-----	High-----	Moderate.
1990----- Otter	B/D	Rare-----	---	---	0-2.0	Apparent	Mar-Jun	>60	---	---	High-----	High-----	High-----	Low.

\* See description of the map unit for composition and behavior characteristics of the map unit.



TABLE 18.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Abscota Variant-----	Sandy, mixed, mesic Typic Udifluvents
Beavercreek-----	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Beavercreek Variant-----	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Becker-----	Coarse-loamy, mixed, mesic Typic Hapludolls
Bellechester-----	Sandy, mixed, mesic Entic Hapludolls
Billett-----	Coarse-loamy, mixed, mesic Mollic Hapludalfts
Blackhammer-----	Fine-silty, mixed, mesic Typic Hapludalfts
Boone-----	Mesic, uncoated Typic Quartzipsamments
Boots-----	Euic, mesic Typic Medihemists
Brodale-----	Loamy-skeletal, carbonatic, mesic Entic Hapludolls
Chaseburg-----	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Comfrey-----	Fine-loamy, mixed, mesic Cumulic Haplaquolls
Dorerton-----	Loamy-skeletal, mixed, mesic Typic Hapludalfts
Dunbarton-----	Clayey, montmorillonitic, mesic Lithic Hapludalfts
Eitzen-----	Fine-silty, mixed, nonacid, mesic Mollic Udifluvents
*Elbaville-----	Fine-loamy, mixed, mesic Glossoboric Hapludalfts
Eleva-----	Coarse-loamy, mixed, mesic Typic Hapludalfts
Eyota-----	Coarse-loamy, mixed, mesic Cumulic Hapludolls
Festina-----	Fine-silty, mixed, mesic Mollic Hapludalfts
Finchford-----	Sandy, mixed, mesic Entic Hapludolls
Flagler-----	Coarse-loamy, mixed, mesic Typic Hapludolls
Fluvaquents-----	Mixed, mesic Fluvaquents
Frankville-----	Fine-silty, mixed, mesic Mollic Hapludalfts
Frontenac-----	Fine-loamy, mixed, mesic Typic Hapludolls
Gale-----	Fine-silty over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfts
*Garwin-----	Fine-silty, mixed, mesic Typic Haplaquolls
*Haverhill-----	Fine, illitic (calcareous), mesic Typic Haplaquolls
Haverhill Variant-----	Fine, illitic, mesic Typic Argiaquolls
Hoopeston-----	Coarse-loamy, mixed, mesic Aquic Hapludolls
Huntsville-----	Fine-silty, mixed, mesic Cumulic Hapludolls
Kasson-----	Fine-loamy, mixed, mesic Aquollic Hapludalfts
Keltner-----	Fine-silty, mixed, mesic Typic Argiudolls
Lacrescent-----	Loamy-skeletal, mixed, mesic Typic Hapludolls
Lamaille-----	Fine, mixed, mesic Typic Hapludalfts
Lawler-----	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aquic Hapludolls
Lindstrom-----	Fine-silty, mixed, mesic Cumulic Hapludolls
Littleton-----	Fine-silty, mixed, mesic Cumulic Hapludolls
Marshan-----	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Haplaquolls
Medary-----	Fine, mixed, mesic Typic Hapludalfts
Minneiska-----	Coarse-loamy, mixed (calcareous), mesic Mollic Udifluvents
Minneopa-----	Sandy, mixed, mesic Aquic Hapludolls
Mt. Carroll-----	Fine-silty, mixed, mesic Mollic Hapludalfts
Nasset-----	Fine-silty, mixed, mesic Mollic Hapludalfts
*Newalbin-----	Coarse-silty, mixed, nonacid, mesic Typic Fluvaquents
NewGlarus-----	Fine-silty over clayey, mixed, mesic Typic Hapludalfts
Nodine-----	Fine-loamy, mixed, mesic Typic Hapludalfts
Norden-----	Fine-loamy, mixed, mesic Typic Hapludalfts
Oronoco-----	Coarse-loamy, mixed, mesic Mollic Hapludalfts
Otter-----	Fine-silty, mixed, mesic Cumulic Haplaquolls
Palsgrove-----	Fine-silty, mixed, mesic Typic Hapludalfts
Plainfield-----	Mixed, mesic Typic Udipsamments
Port Byron-----	Fine-silty, mixed, mesic Typic Hapludolls
Psamments-----	Mixed, mesic Psamments
Racine-----	Fine-loamy, mixed, mesic Mollic Hapludalfts
Rockton-----	Fine-loamy, mixed, mesic Typic Argiudolls
Rollingstone-----	Very fine, mixed, mesic Typic Paleudalfts
Seaton-----	Fine-silty, mixed, mesic Typic Hapludalfts
Shiloh-----	Fine, montmorillonitic, mesic Cumulic Haplaquolls
*Sogn-----	Loamy, mixed, mesic Lithic Haplustolls
Southridge-----	Fine-silty over clayey, mixed, mesic Typic Paleudalfts
Spinks-----	Sandy, mixed, mesic Psammentic Hapludalfts

TABLE 18.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
Timula-----	Coarse-silty, mixed, mesic Typic Eutrochrepts
Tripoli-----	Fine-loamy, mixed, mesic Typic Haplaquolls
Udorthents-----	Loamy, mesic Udorthents
*Waubee-----	Fine-silty, mixed, mesic Mollic Hapludalfs
Waukee-----	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludolls



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